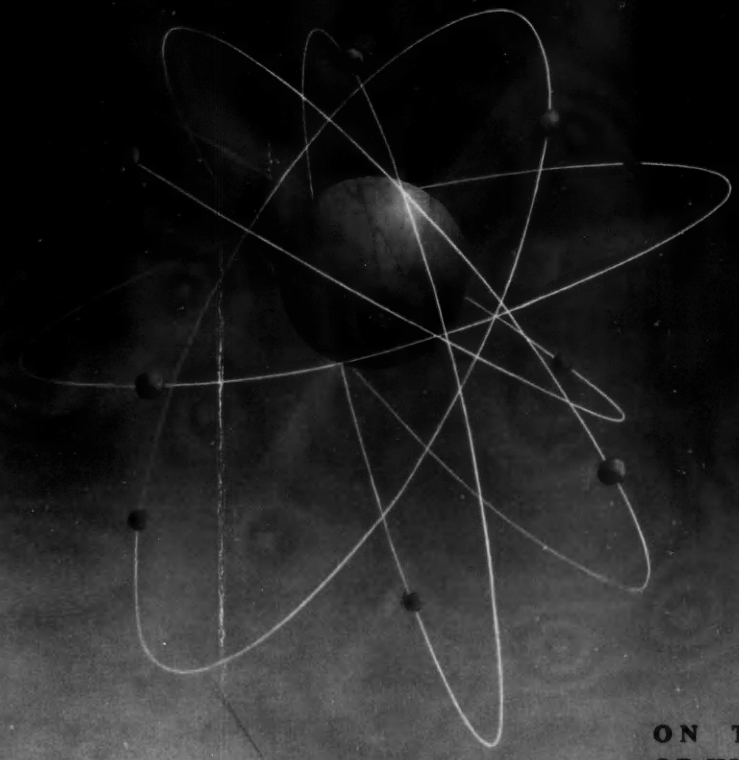
3 JUNE 1954 NINEPENCE

ELECTRICAL TIMES



ON THE FRONTIERS OF HUMAN KNOWLEDGE

Now the Engineer finds himself on the very frontiers of human knowledge. Already he is striving with the Scientist to harness atomic energy for the benefit of mankind.

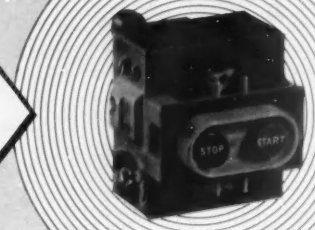
At *the first atomic electric generating station* now under construction at Calder Hall in Cumberland, the turbo-alternators will be driven by *steam*, generated — by means of a nuclear reactor — in plant jointly designed by Babcock & Wilcox and the Department of Atomic Energy; and manufactured by Babcock and Wilcox.

Calder Hall is the forerunner of much larger developments which, by conserving conventional fuel resources, will be of vital economic importance to Great Britain and, indeed, to the world.

BABCOCK
STEAM-RAISING PLANT

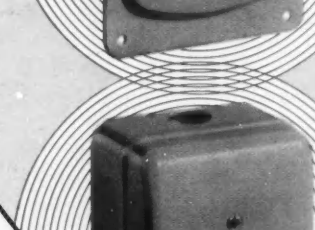
RELIABLE LOW-COST PROTECTION FOR THE *SMALL* ELECTRIC MOTOR

For INSET MOUNTING



For FLUSH MOUNTING

For SURFACE MOUNTING



FEATURES OF THE TYPE D-6 HAND OPERATED STARTER

- Exceptionally Small Size
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- Ready Adjustment to Motor Current on Site
- Automatic 'Free Handle' Release
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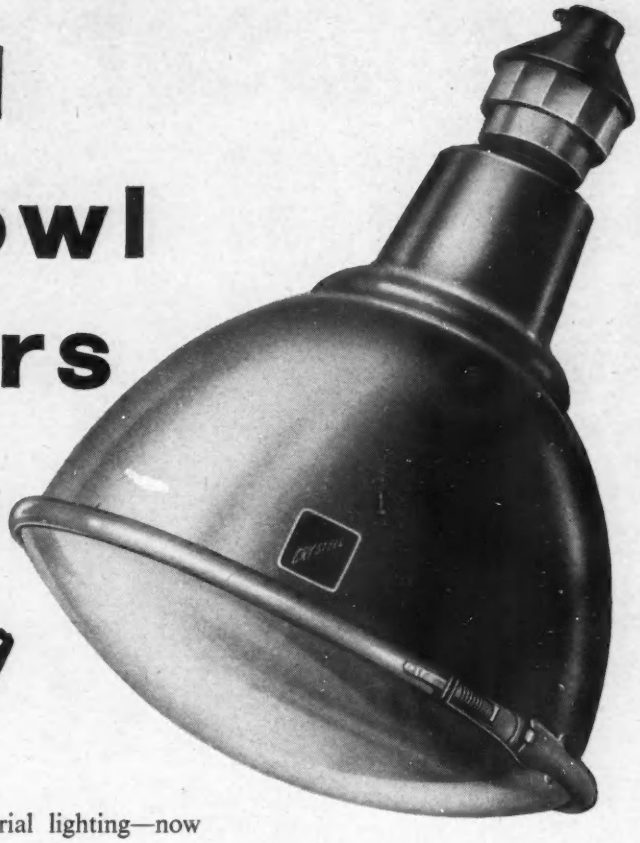
BENJAMIN REGD.

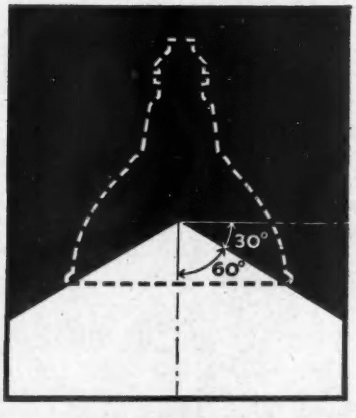
deep bowl reflectors

for Quality Lighting



Benjamin—renowned for quality in industrial lighting—now take a great step forward by introducing the Deep Bowl Reflector. Indeed, this is one of the major advances in quality lighting of modern times. By its increased depth, this reflector provides maximum comfort and clarity of vision.

The illustration shows the Deep Bowl Reflector with Heavy Duty Top and Dustproof Visor. These features should always be specified . . . and remember—first-class lighting demands first-class accessories! Benjamin give you all this and at practically the same cost.



The usual Benjamin 'quality' features, Crysteel Vitreous Enamel finish, Saaflux Temperature Reducing and easy maintenance, are incorporated.

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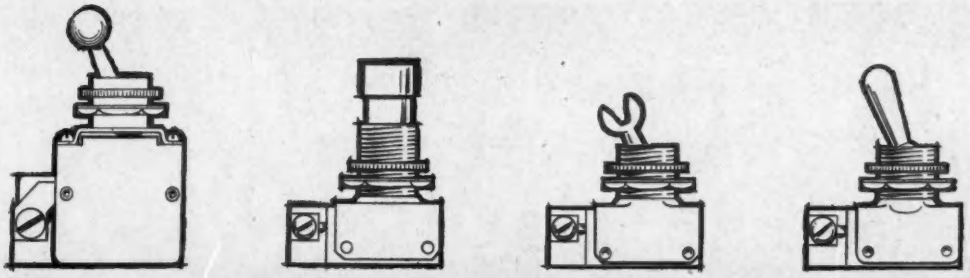
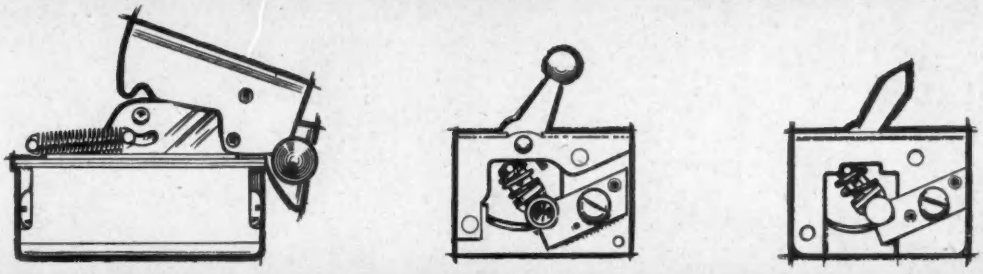
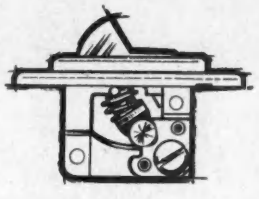
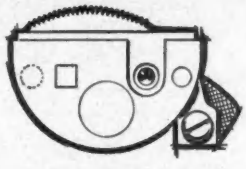


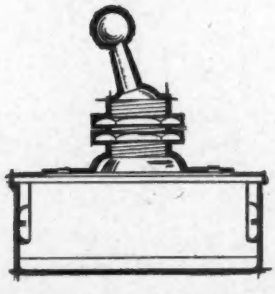
APPLIANCE



SWITCHES by







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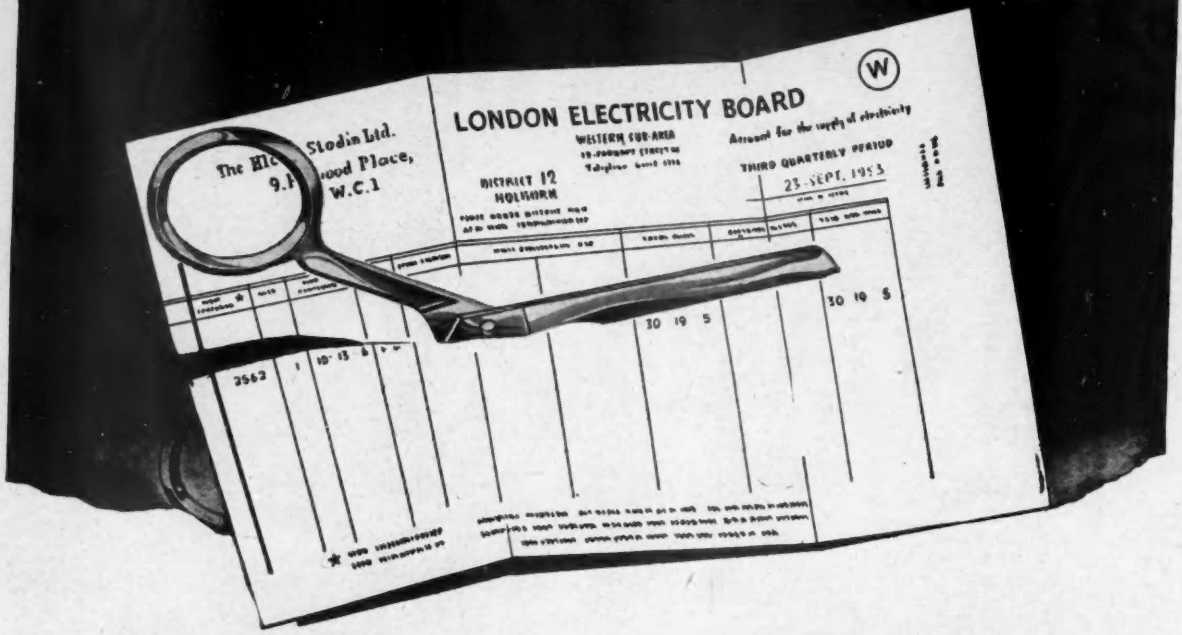
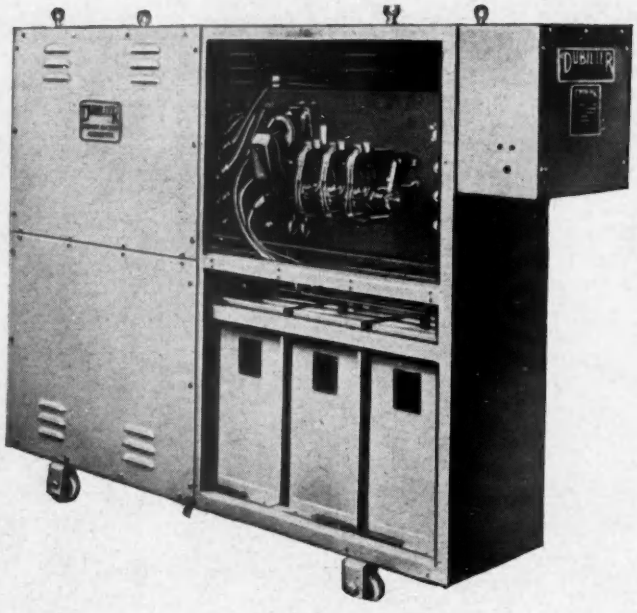


Install

DUBILIER POWER FACTOR CORRECTION CAPACITORS



The installation of DUBILIER Power Factor Correction Capacitors represents an economy in power costs which will rapidly reclaim your inital outlay. Let our engineers conduct an investigation of your present power factor without cost or obligation, and confirm whether the installation of DUBILIER capacitors would be to your advantage

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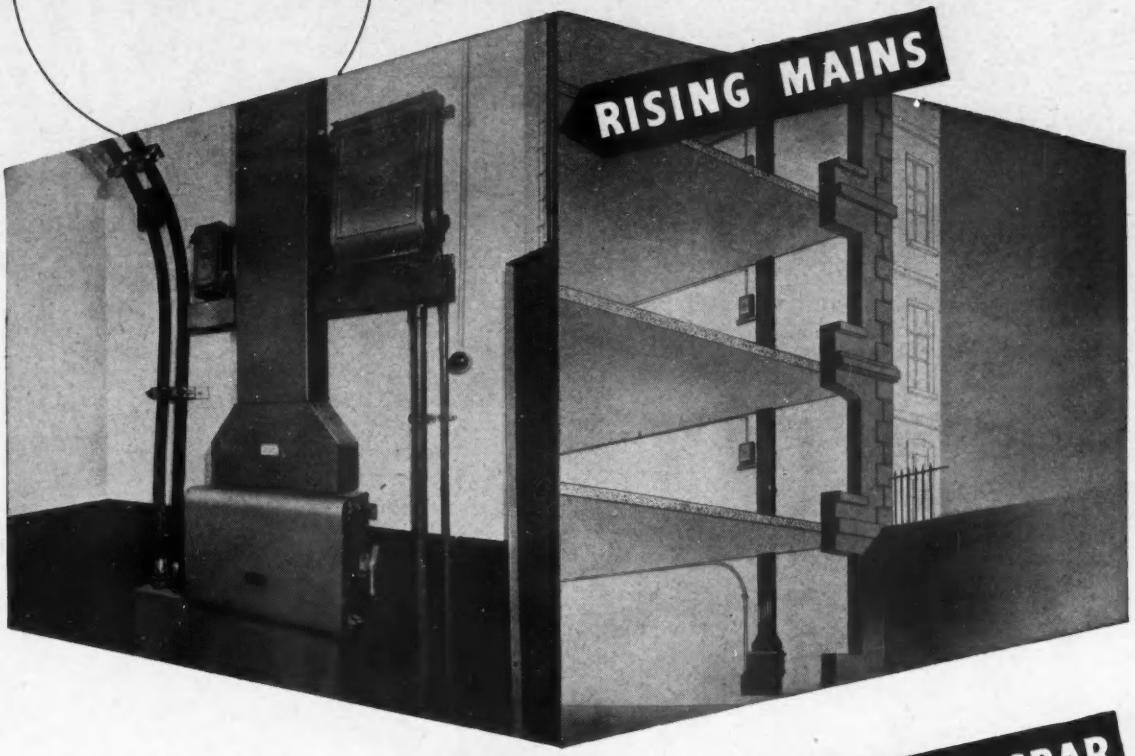

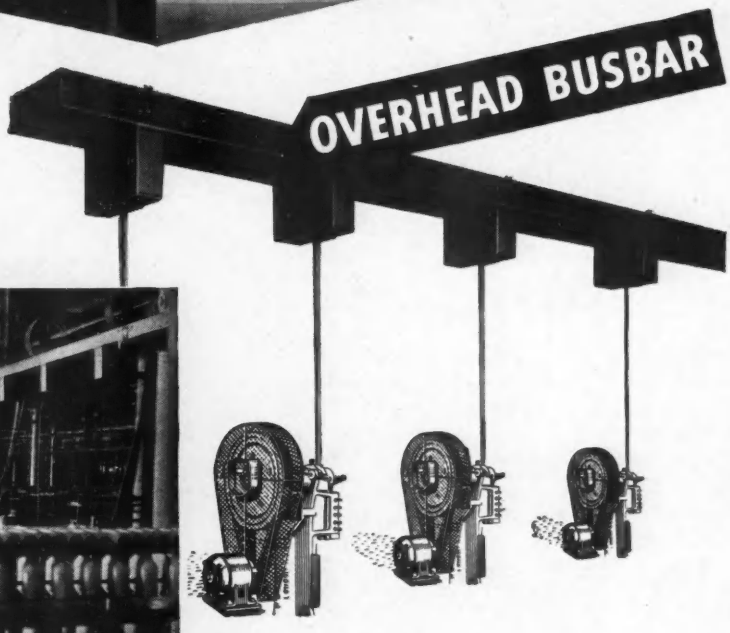

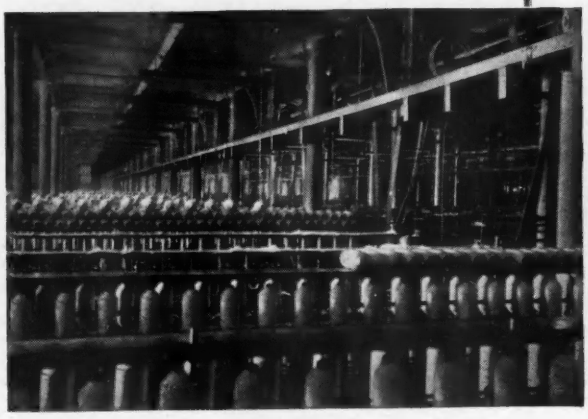

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with the now famous and exclusive inner glass door

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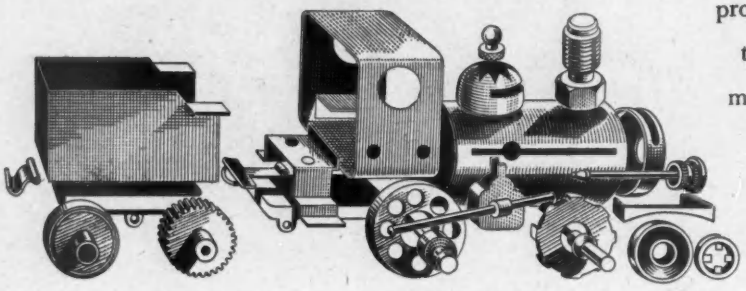

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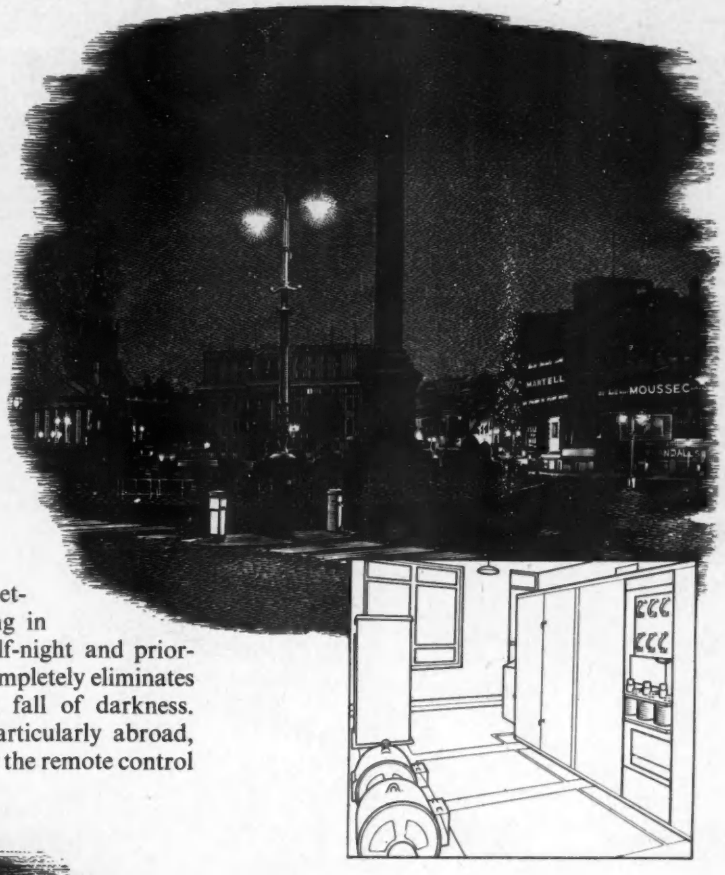
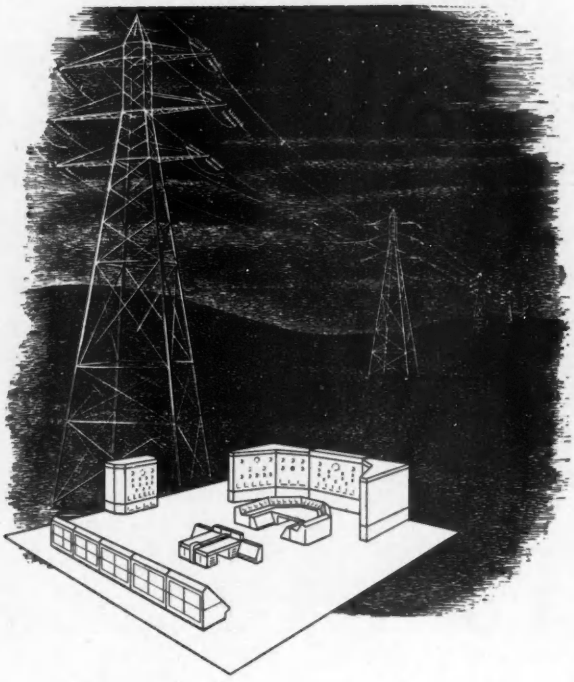
These CONTROLS benefit the citizen



A.T.E. Rythmatic Ripple Control for street-lighting—as employed to control lighting in Trafalgar Square—provides all-night, half-night and prior-dawn switching from a central point . . . completely eliminates the dangers consequent upon a sudden fall of darkness. "Rythmatic" equipment is also used, particularly abroad, with considerable economy and success for the remote control of water heaters.



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A.T.E. Supervisory Remote Control for the super-grid will assist in maintaining the effective control of generation and transmission that is vital to efficiency in the largest integrated electricity distribution network in the world . . . serving a population of nearly 50 millions.

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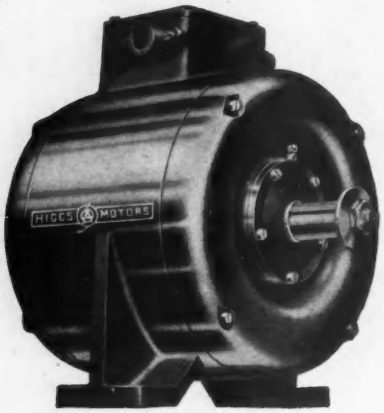

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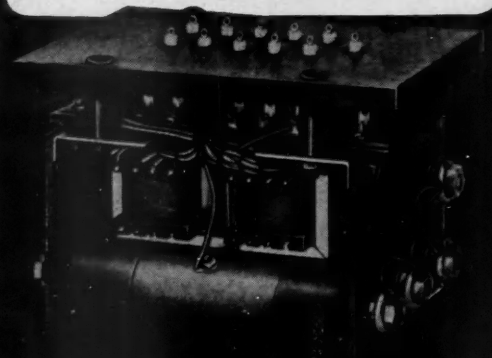

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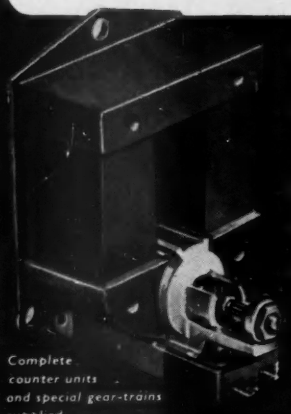

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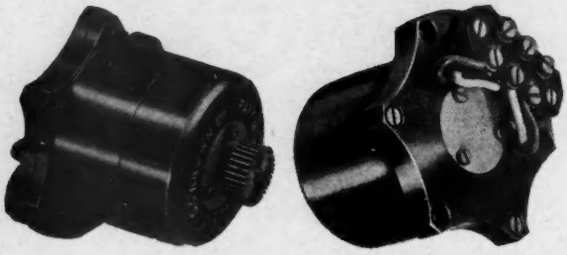

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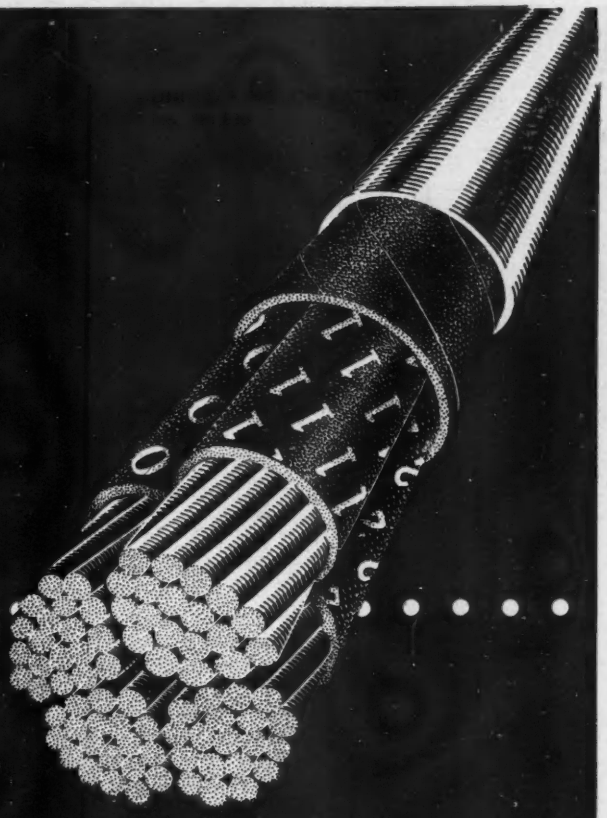

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IMPORTANT FEATURES

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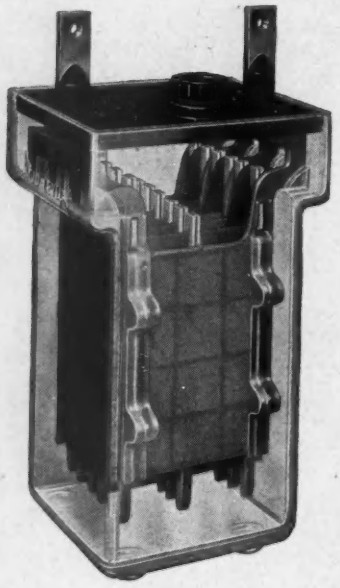
65 years have passed since the first D.P. battery was made

Every D.P. battery produced to-day embodies the wide experience gained during this long period devoted exclusively to the manufacture of batteries for all purposes.



The two examples illustrated are a sealed type 75 ampere-hour cell as used for emergency lighting and power stations, and a large 10,200 ampere-hour cell in a wood lead-lined box.

Sizes of Planté batteries manufactured and installed by this company, range in capacity from 10 to 13,000 ampere-hours.

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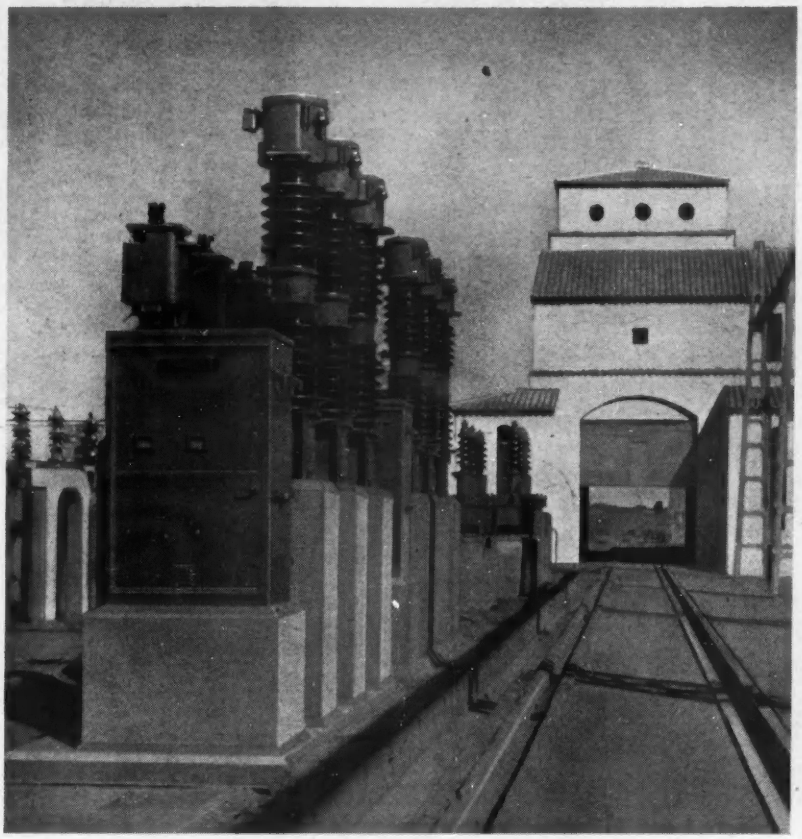

66-kV
small-oil-volume
switchgear
in an
outdoor substation

Entrance to sub-station

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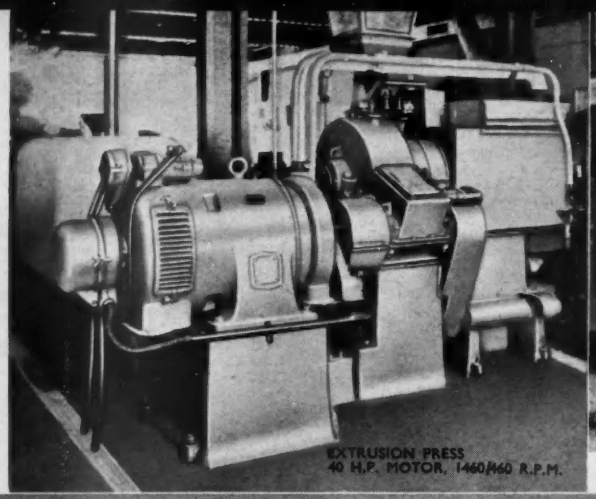
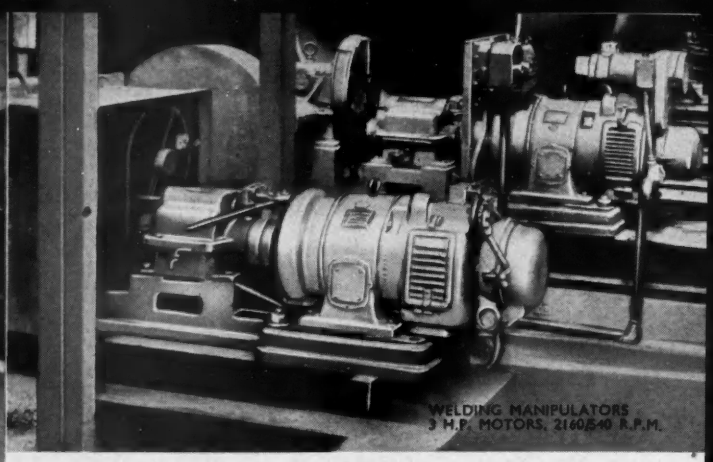
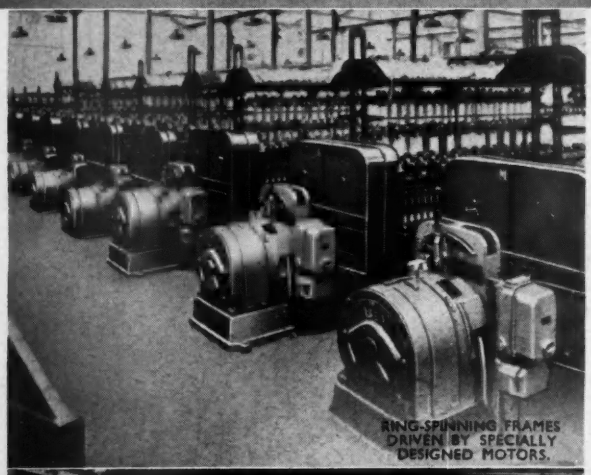


EXTRUSION PRESS
40 H.P. MOTOR, 1460/460 R.P.M.

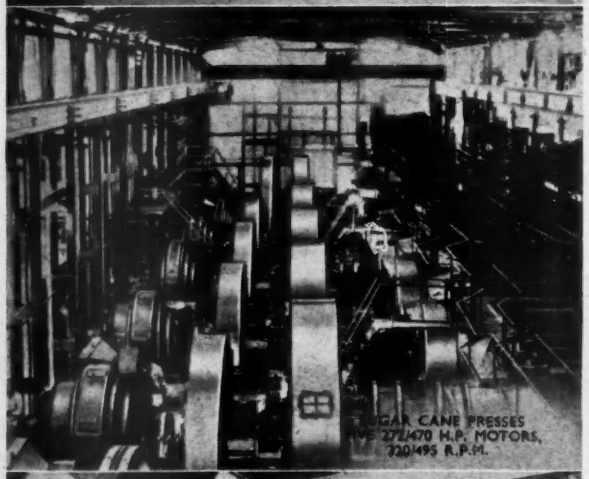


WELDING MANIPULATORS
3 H.P. MOTORS, 2160/540 R.P.M.

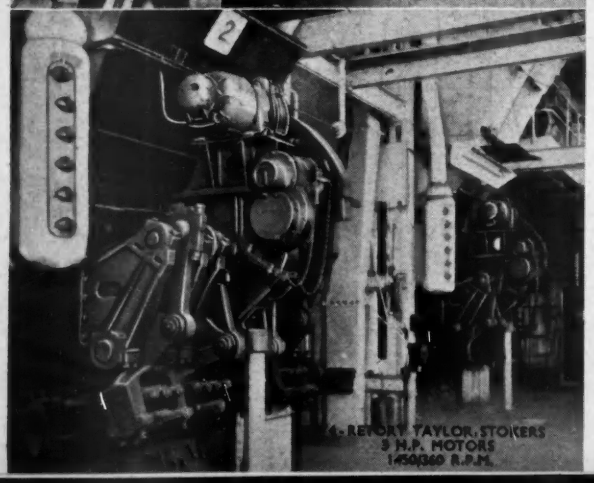
3-PHASE COMMUTATOR MOTORS



RING-SPINNING FRAMES
DRIVEN BY SPECIALLY
DESIGNED MOTORS.



SUGAR CANE PRESSES
[illegible] 272/470 H.P. MOTORS,
220/495 R.P.M.



4-RETORT TAYLOR STOKERS
3 H.P. MOTORS
1450/360 R.P.M.

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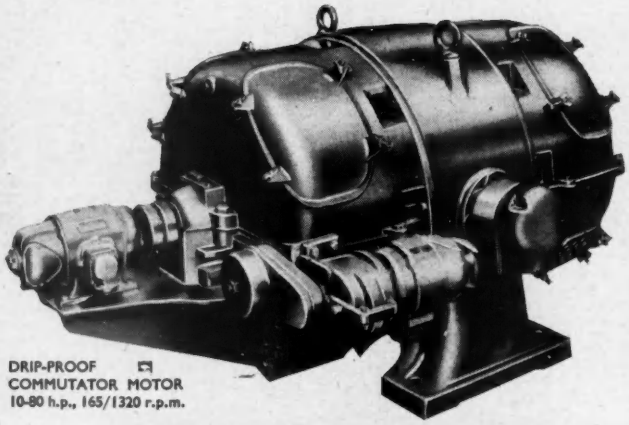

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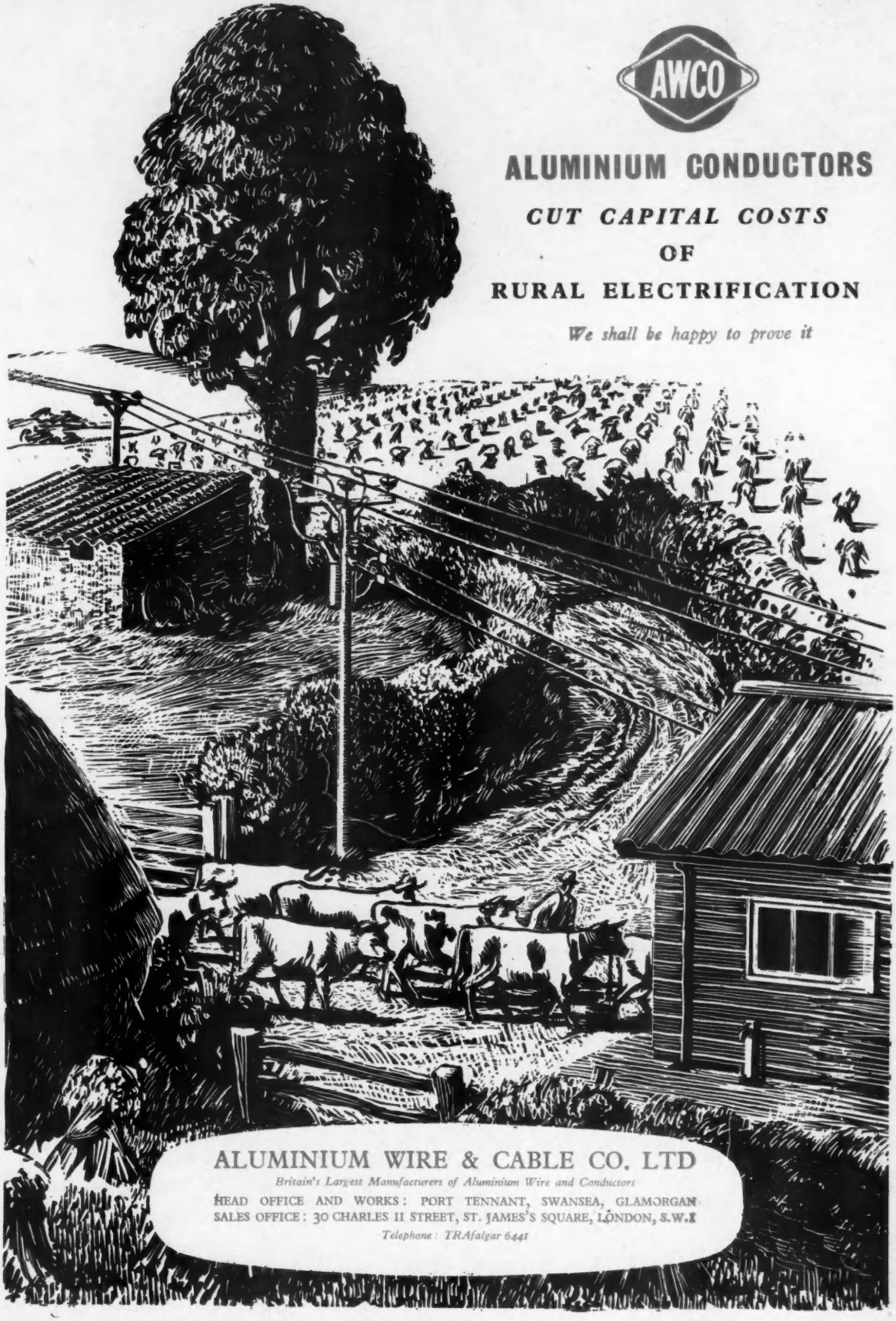

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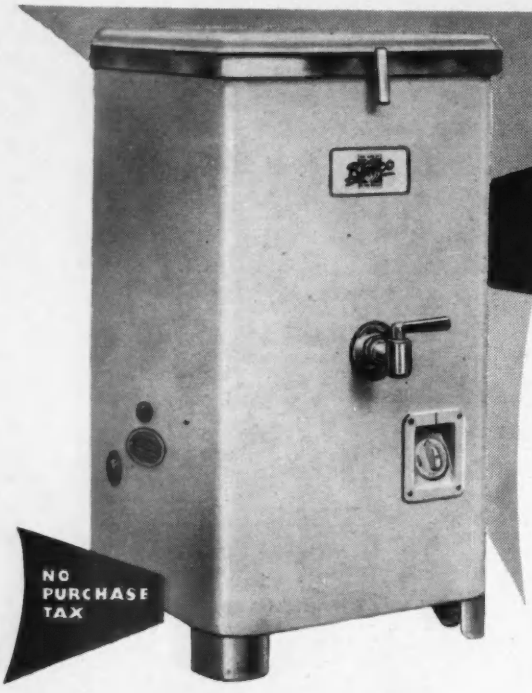

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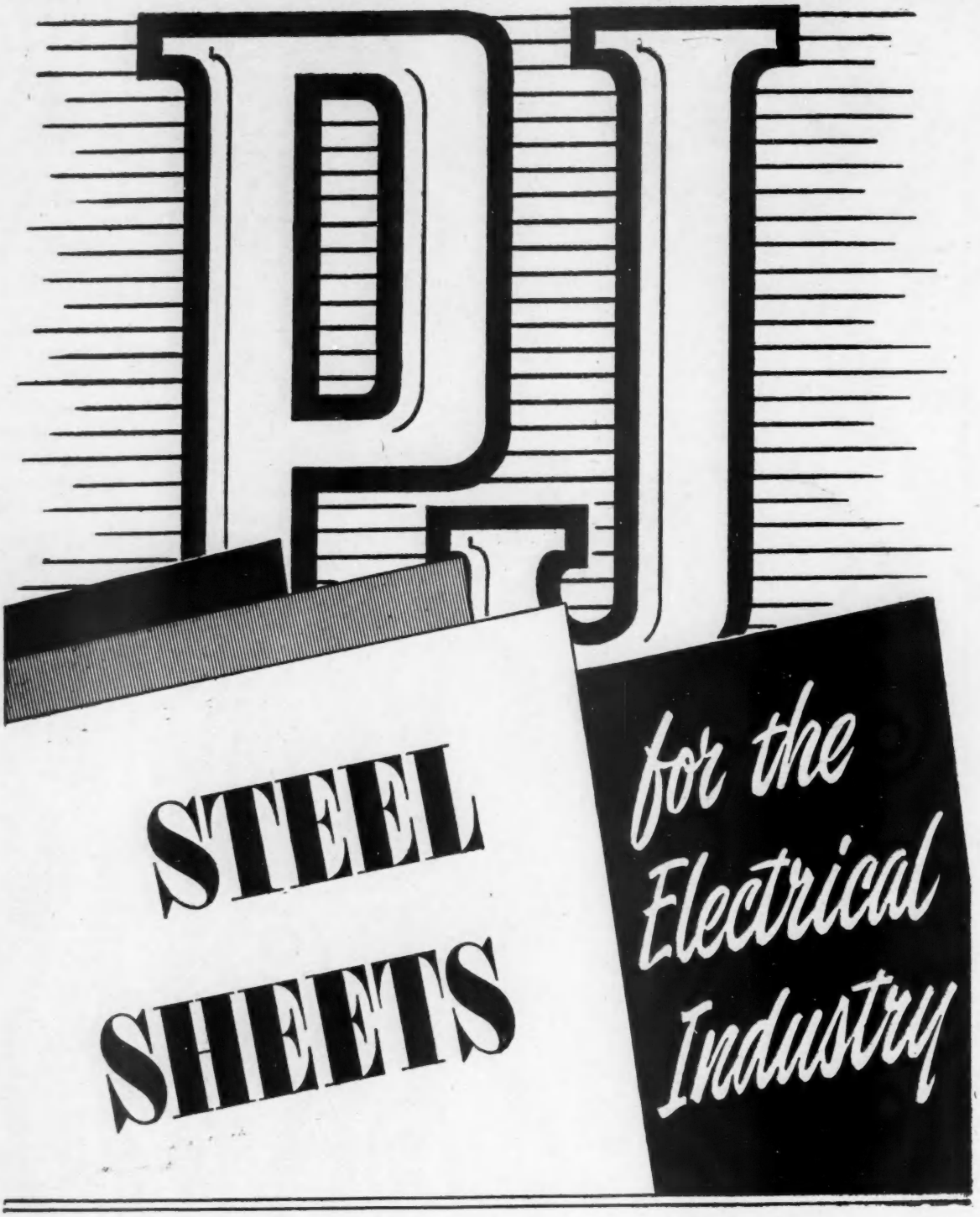

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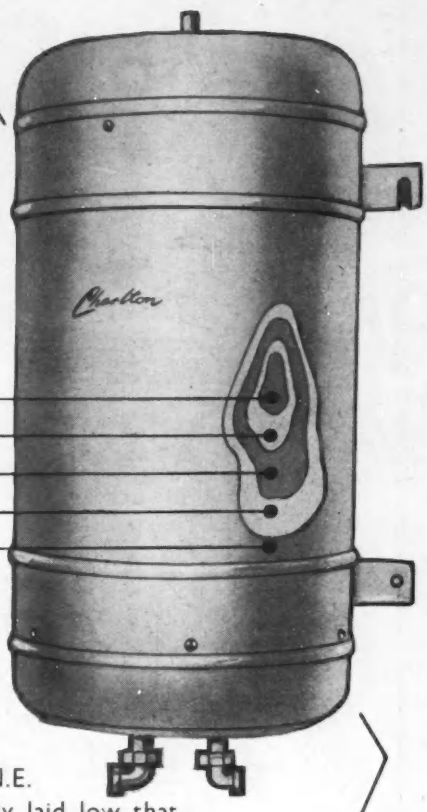

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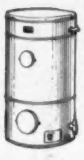

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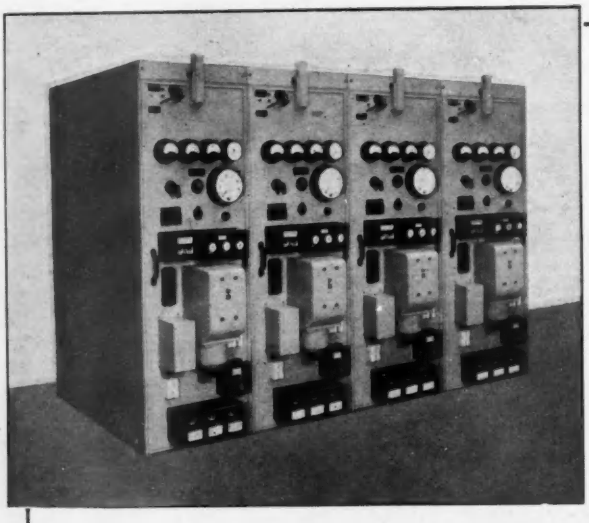

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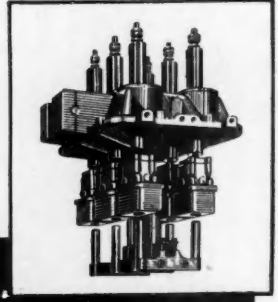

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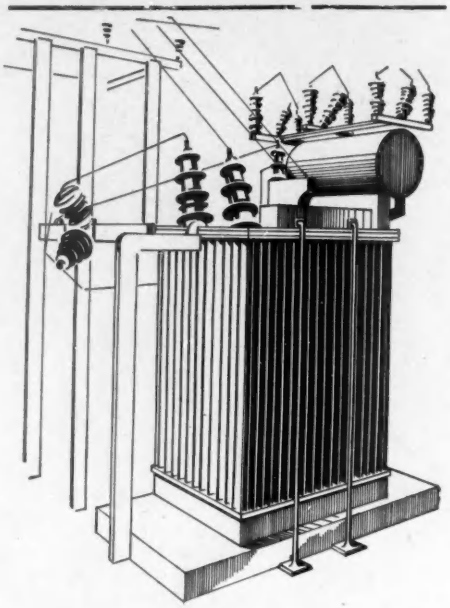

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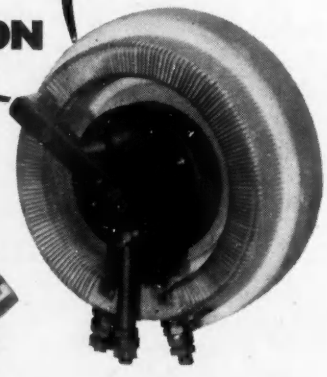

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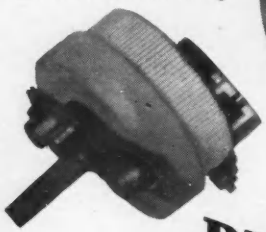

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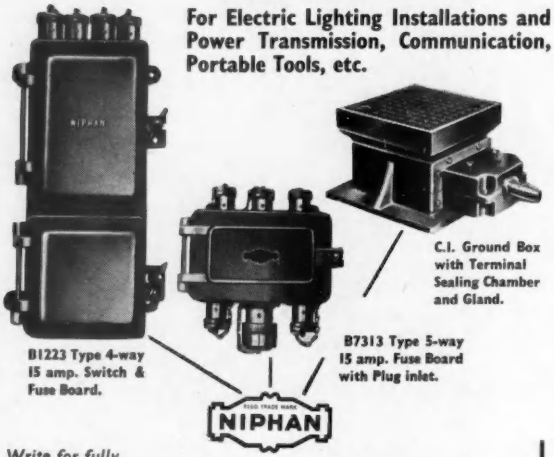
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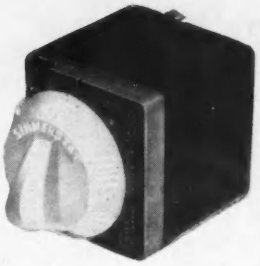

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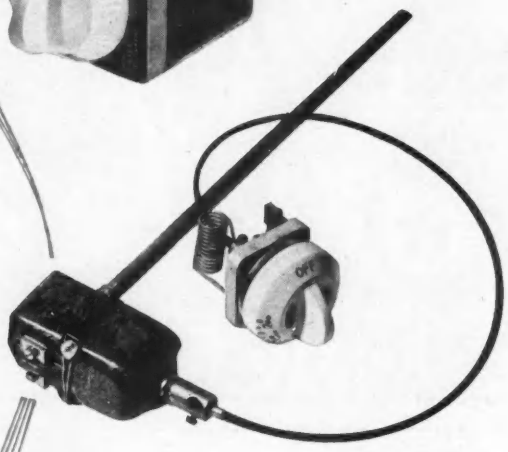

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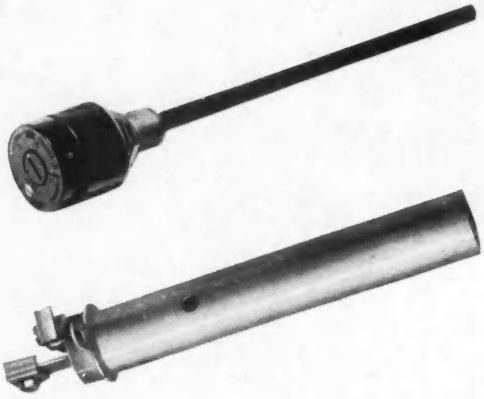

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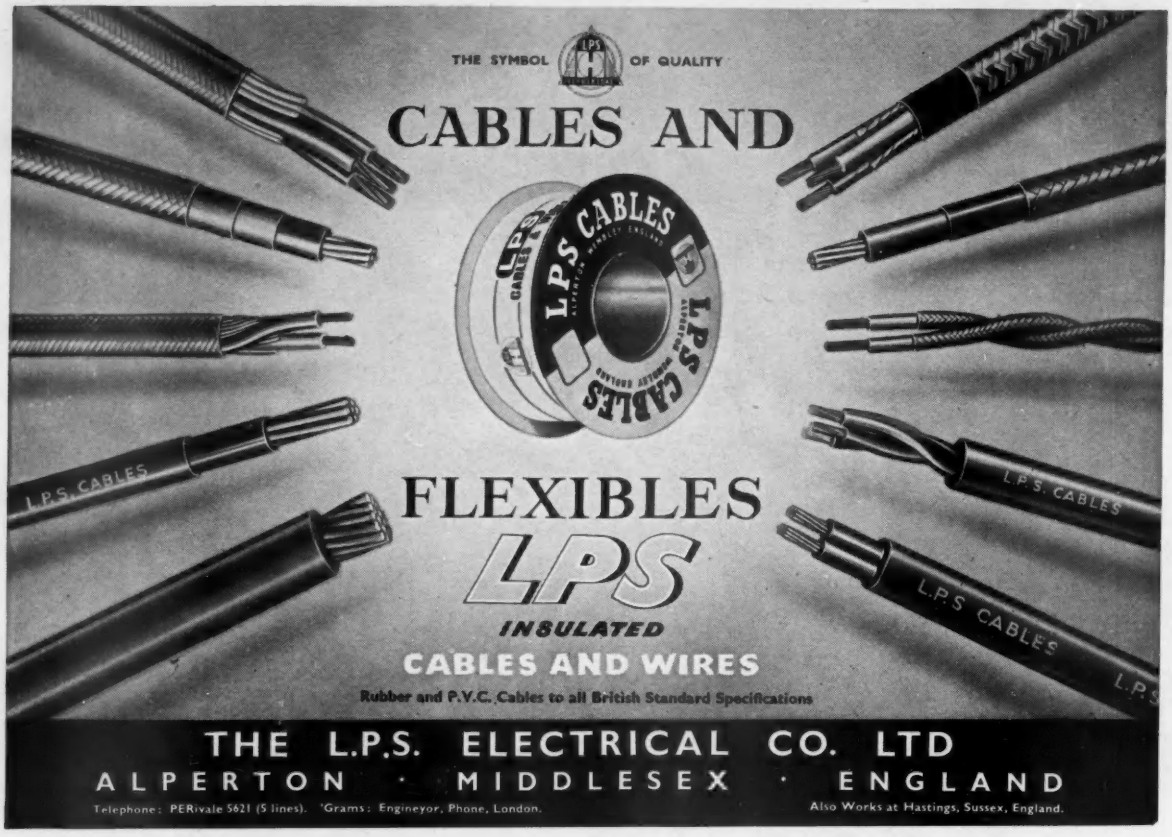
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SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2.
Telephone: HOLborn 6016
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ROY BALDWIN, M.I.E.E., Barrister-at-Law

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United Kingdom and Overseas £2. 10s. 0d. per annum. Canada $7.50, U.S.A. $7.50 per annum. Subscriptions are payable in advance and may commence with any issue throughout the year. Overseas subscriptions may be paid to The Electrical Times Limited by banker's draft, cheque or international money order. Single copies price 9d. each.

IMPASSE IN INSTALLATION INSPECTION

The months pass by, and still there comes no sign of a final report from the committee set up on the initiative of the B.E.A. to organise a National Inspection Council for Electrical Installation Contracting. Officially, the cause of delay is that one of the constituent organisations is considering the terms of the report, but it is no secret that this means the Electrical Contractors Association is maintaining its stand on compulsion as against the voluntary principle favoured by some other bodies. The latest moves, to judge from the progress report given at the recent E.T.U. conference, is in the direction of a compromise that will make inspection compulsory, and give inspectors statutory backing for any condemnation of wiring work which they may pronounce. Even this is a half-way house for the E.C.A., since earlier this week, in an address to the Association's annual conference which we shall be reporting more fully next week, the President declared his belief that nothing short of compulsory registration of the electrical contractor and the electrical operative will solve the problem of the unauthorised and potentially dangerous extension to an existing installation. But has this E.C.A. demand some chance of success, or will its eventual official communication merely set off another round of time consuming consideration by interested parties? There is general agreement that the public should be protected by some inspection organisation; are the advantages to be lost because of disagreement on the sanctions with which the rulings of that authority are to be backed? Clearly, this is a position that cannot be allowed to deteriorate into a stalemate. Whatever may be the ultimate goal to be desired, some progress is necessary now, and the initiative lies with the B.E.A. to explore every possibility of escaping from this impasse.

POWER AND CIVILISATION

With no more than a modest load growth of just over six per cent per annum, America is faced with an expansion of 320,000 MW in the next twenty-five years. The significance of this on the national economy was stressed by Mr Philip Sporn in a lecture at the I.E.E. last week. This increase will demand capital expenditure at no less a rate than $5,000m per year, a significant part of the capital resources of the country. No less a problem will arise from the demands for fuel and perhaps more acutely, for technical manpower. These are trends which are affecting all industrial countries to a greater or lesser degree and the question then arises, when will a halt be called to this insatiable appetite for electric power? It is

axiomatic that we cannot stand still, yet can civilisation survive this tremendous expansion in capital development, of which the electrical programme is but a yardstick to what is happening throughout the whole of industry? It would seem that the rising standard of living throughout the world may be outstripping the world's resources in capital, in raw materials, and in manpower. If this be so, the ultimate outcome, in whatever form it may arise, will be black indeed. Fortunately for we electrical engineers, the task of weighing such trends is not ours. We have merely to meet the demands made on us and although in the past we have talked, perhaps too glibly, of saturation of the load, at present there is no sign of it, nor any indication of the economic forces that will be unleashed when saturation is reached if the resources of civilisation prove adequate for its attainment.

THE COST OF D.C.

High voltage d.c. transmission as a means of supplying bulk power over long distances was another subject which was commented on by Mr Philip Sporn. His remarks were, however, singularly terse. In his view it was uneconomic to use d.c. because the cost of terminal equipment was disproportionately high. Such a statement coming from an engineer of the high calibre of Mr Sporn necessarily commands respect. It is, perhaps, unfortunate that it should have been made at a time when the first commercial high voltage d.c. transmission system at Gotland is just getting into its stride. At the moment, however, there can be no doubt that Mr Sporn's statement is correct. The high cost of the Gotland installation, largely due to the extensive development work necessary, had to be written off to bring the scheme within the limits of commercial operation. Although much of the initial expense should not recur with other projects the special nature of the terminal equipment will always remain a major item of cost. Therefore, while d.c. may not be able to compete economically with a.c. transmission for normal systems there will inevitably arise special cases—and Gotland is one of these—where it may provide a more acceptable solution to the particular problems encountered.

DOOR TO THE MIDDLE EAST

The primary lesson to be learned from the report of the Mission to the Middle East is not to regard this area as a single integral market, for it is abundantly clear that each of the five countries encompassed in the report has widely differing economic conditions and trading practices. Only by regarding each country as an individual commercial entity can we hope to expand or even retain our trade. These markets are of special importance since they provide an outlet for consumer goods in a world where local manufacture is causing a drying up of demand, but where in consequence, severe competition has to be faced from continental and eastern countries as well as America. Heavy plant presents a not widely dissimilar picture. The familiar story is told in the report, of better credit terms being offered by competitors, of the necessity for firm delivery dates and the need for closer contact between manufacturers and the countries concerned. Much also can be done to help in the training of local students and with technical education. Certainly this report provides a wealth of information that must be invaluable to all concerned with selling in these five markets. It would have been useful, however, if more could have been added on local trading practice for those who are contemplating entering this market.

HYDRO POWER IN MINIATURE

Large dams, sizeable alternators and extensive storage reservoirs spring to mind when the subject of hydro-electric generation is introduced. Yet hydro power may be used in far smaller packets to set on foot the electrification of an under-powered countryside, and a recent report of the U.N. Economic Commission for Europe has described how it is likely to do this in some parts of Eastern Europe. Small sets, up to a few hundred horse power in rating, are the probable power sources, and in their operation, techniques will have to be adopted which have a novel ring about them when viewed in the light of normal practice. For example, it is recommended that to improve electrical performance, the sets should operate on a substantially constant load, at times of light load, feeding to resistances which are cut out as the useful demand comes on. Again, a high degree of standardisation is called for in place of the usual special design, both to reduce first cost and to enable repairs to be made on a take out and replace basis. In this respect, the remarkable achievement is recorded of an Electricité de France study which showed that 80% of 5,000 cases investigated could be harnessed with one of three capacities of turbine 12, 40, and 120 h.p. This country is not without experience of rural development based on the ingenious use of small hydro resources, and there will be interest in comparing the methods eventually adopted in those parts of Europe now being electrified.

THE MISUNDERSTOOD INDUSTRY

With the audacious title "Change is our Ally," the recent manifesto by ten Conservative M.P.s is noteworthy as far as electricity is concerned, for a complete absence of change in viewpoint. All the old familiar misunderstandings are here: exactly equating price with cost, discouragement of domestic consumption and the setting up of a committee to "police" supply tariffs. There is even a hankering after the Clow surcharge bludgeon as a means of restricting domestic consumption; it is considered that this imposition was tried for too short a time in 1947 to determine its effect. Then, again, we are treated to an explanation on the relative efficiencies of various appliances. The authors are quite content to quote from a report two years old; one which is outdated by the increased efficiency of electricity generation. The whole distorted picture presented in this publication is also not new. It shows again how the basic factors are misunderstood by so many who have the public ear and underlines once more the need that everyone in the supply industry should play his part in public relations work. This attitude of mind must start with the senior men, with those whose position carries weight in local and national circles. Only in this way can we hope to assail the entrenched position that these misunderstandings now hold.

Meteor

Power Transmission by Direct Current

THE SWEDISH MAINLAND—GOTLAND UNDERSEA LINK

THE main problem of high-voltage d.c. transmission lies essentially in the design of the valves. In Sweden, development work on suitable valves began as far back as 1929 when the first ASEA patent was applied for on the principle of grading electrodes, which, interposed between anode and cathode of a mercury-arc valve, would increase reliability against back-firing. Progress since that date has been slow but continuous. In 1942 the first test valves were completed, and between 1942 and 1945 experiments were continued to increase both capacity and output voltage. In the final stage of these experiments a complete 6-valve rectifier for about 2,000 kW with a maximum d.c. voltage of 40 kV was operated with a similar inverter.

The State Power Board had watched these experiments with interest and had already been providing power for the tests free of charge. A pilot plant was erected in 1945, using an existing 50 km long three-phase line between Trollhättan Power Station and Mellerud substation, and comprised two six-phase convertors in each station, each rated at 3,250 kW, 45 kV, d.c. By 1947 it was realised that to make further progress, larger resources were needed, and the so-called Ionic Valve Laboratory was completed in 1951.

The Gotland Scheme

Gotland is a large island separated from the mainland by about 63 miles. There exists a steam-plant on the island, and the load is about 16 MW. By installing the d.c. connection, with a capacity of 20 MW from the mainland to the island, or 10 MW in the reverse direction, a significant decrease in the cost of power could be made with an additional saving of some 40,000 tons of imported coal/annum. A substantial contribution to the price reduction was made by the Government's agreement to write off immediately the capital costs of the installation.

Power is drawn from the 130 kV, 50 c/s network on the mainland and fed to a rectifier station in the vicinity of Västervik where it is converted to 100 kV, 200 amp d.c. This is transmitted to Gotland through a single-core cable about 100 km long. At an inverter station, near Visby on the island, the d.c. is converted to a.c. which, via a 10 kV intermediate voltage is fed into the Gotland 30 kV network. The reactive power required for the network and the inverters, about 15 and 9 MVAr respectively, is provided by a 10 kV, 30 MVAr synchronous condenser. The return d.c. path is through the sea. At present, only one rectifier is installed in each convertor station, but a second unit is to be put in during this year. There are two transformers per unit to give a six-phase output. All the valves are similar, and each "group" is rated for 200 A, 50 kV, d.c.

The rectifier transformers at Västervik have a voltage ratio of 130/40 kV and are equipped with on-load tap-changers, while those at Visby are 10/40 kV units without tap-changers. At the latter station the 10 kV windings of the two rectifier transformers are connected on both sides of a compensating reactor, the centre tapping of which is connected to the 10 kV busbar to which the synchronous condenser is also connected.

Normally, the system is supervised from the inverter station at Visby, from which the Västervik station can be controlled through a radio link. Certain measurements are, therefore, transmitted from Västervik to Visby, while control and regulating impulses are sent out in the opposite direction. In addition, some important circuit breakers, etc., at Västervik are remotely controlled by means of a step selector. In the event of a radio link failure, the installation is automatically switched to standby service, which implies that it will no longer be regulated automatically for the highest efficiency. On restoration of communication the system is put back into normal service by hand.

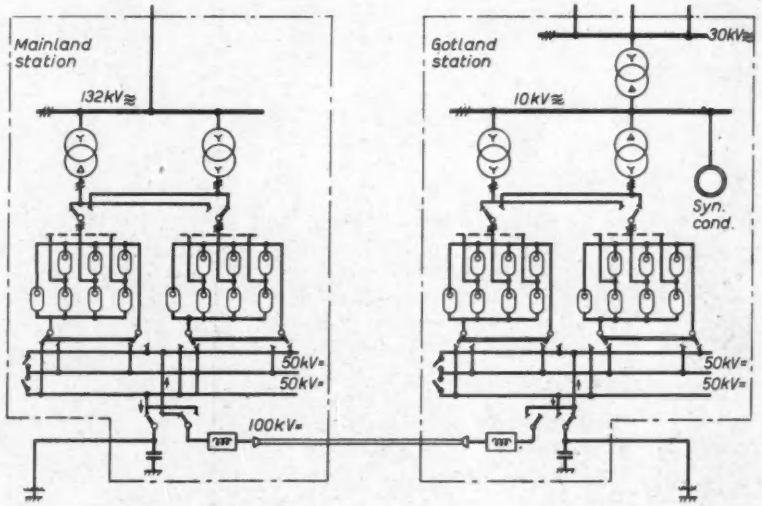
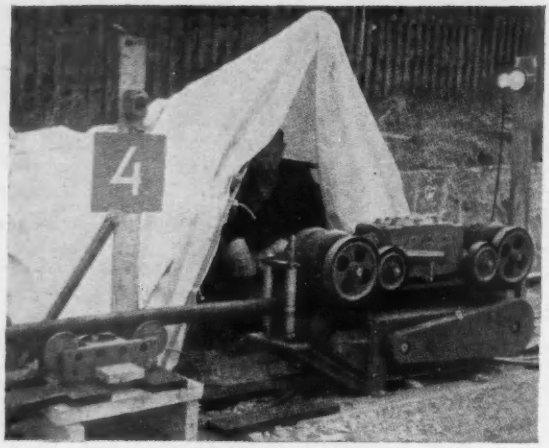


Fig. 1. This schematic diagram shows the principal rectifier and mutator circuits at Vastervik and Visby. The grid control circuits have been omitted for clarity. It should be noted, however, that both units are fundamentally the same, a feature permitting reverse working



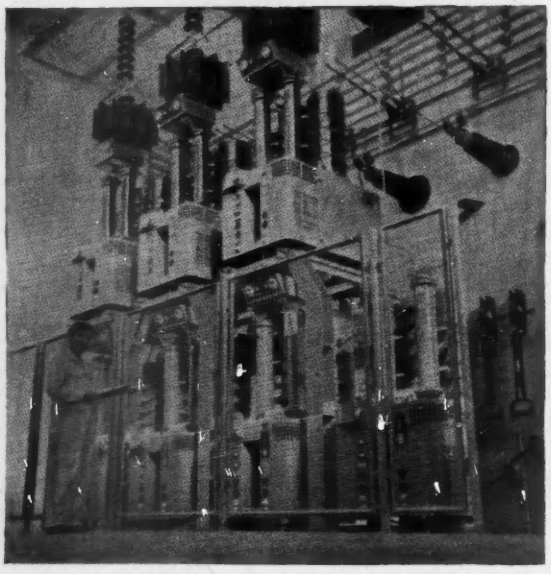
One of the special hauling devices transporting the cable

As shown in Figure 1, the valve switching arrangements appear to be complicated as it was decided to include valves to act as standby to those in normal operation. It will be seen that the two main transformers have a 30° displacement thus providing the equivalent of 12-phase operation. A reactor, included in the inverter station (not shown on the diagram) neutralises the mutual influence between the two inverters to permit satisfactory operation.

Valve Design

Full details of the valves were not disclosed in the C.I.G.R.E. paper by B. G. Rathsman and A. U. Lamm, from which this information has been abstracted. They are, however, of the mercury-pool semi-pumpless type having continuous excitation. The condensing chamber has aluminium cooling fins and is forced air cooled. Two anodes are provided per valve, working in parallel, and a special current distribution device is included to minimise back-firing. Control is exercised by grids, which are impulsed by a "control-impulse transmitter." This in its turn is operated by a weak voltage derived from a phase-angle producer combined with an automatic regulator. For inverter operation, the phase-angle producer consists of a

Valve assembly in a convertor station



new static device, which, for each main valve, is fed by and is sensitive only to the commutation voltage of that valve, and to the input grid current. That device, which has been named "consecutive grid control" is a sort of calculating machine consisting of transformers, dry-type rectifiers and reactors and ensures a constant commutation margin for the valve irrespective of the magnitude and dissymmetry of the a.c. voltage and irrespective of the direct current. This device provides the normal grid control of the inverter so that it operates under the most favourable conditions with the best combination of high p.f. and safety of operation.

Power regulation is carried out by the rectifiers in the transmitting station, the aim being to maintain constant frequency on the Gotland system. A frequency sensing device sends signals from Gotland to the mainland over the radio link, and these signals act on the grid control of the rectifiers. Precautions are also taken to prevent damage to the equipment in the event of commutation failure or arc-back in the rectifiers.

Earth Return

As the d.c. current returns to the mainland through the sea, precautions had to be taken to avoid the possibility of corrosion. The earth return electrode stations are, therefore, located at a distance of 10 km from the d.c. cable. On the Västervik side, where the electrodes operate normally as anodes, they consist of twelve parallel connected standard furnace electrodes of magnetite or graphite. Each of these is one metre long and has a diameter of 120 mm. At Visby, the electrodes are normally cathodic and consist of bare copper wires. The total resistance between the electrodes on both coasts is about 1·4 ohms.

D.C. Cable

The d.c. cable is designed for 100 kV d.c. and will carry 200 amp. An insulation class of 425 kV was specified. The type selected uses a solid conductor and an insulation composed of very dense paper applied under considerable stress. The conductor area is 90 sq mm, and the insulation thickness, 7 mm. Two types of armouring were used; for the sea cable, which lies at a depth of about 100 m, where the bottom is smooth and there is no sea current, galvanised wire 4 mm was introduced. For the shore ends, where hazards are numerous, an additional layer of galvanised steel wire 6 mm in diameter was applied.

A flexible joint was developed, with a diameter only slightly greater than that of the main cable. In the finish the cable consisted of two lengths, one of 50 miles and the other of 12·5 miles. The 50 mile length was manufactured as sea cable with a short length of shore cable attached, while the 12·5 mile length constituted the shore cable for the mainland side.

The distance between the factory and the harbour is about 2·2 miles. A roller track was laid over the roof of the factory, along a railway track, along and over streets and through tunnels. Special haulage devices were located along the track at intervals of about 300 metres, and the cable was hauled directly from the factory to the cable laying ship. Laying itself was carried out from the shore ends at about 6 knots.

On 7th March the first power began to flow, limited to about 2,000 kW due to the absence of the synchronous condenser. After two weeks' operation, a fault occurred in the cable, due to mechanical damage. This has now been repaired and up to the present the system has transmitted power up to 10,000 kW. Owing to the late spring floods, it has also been operated in reverse sending steam power from Gotland to the mainland during the water shortage, and so far results have been most satisfactory.

Showground Generation

MOBILE POWER PLANT PROVIDES 1,200 kW—AND HOT WATER

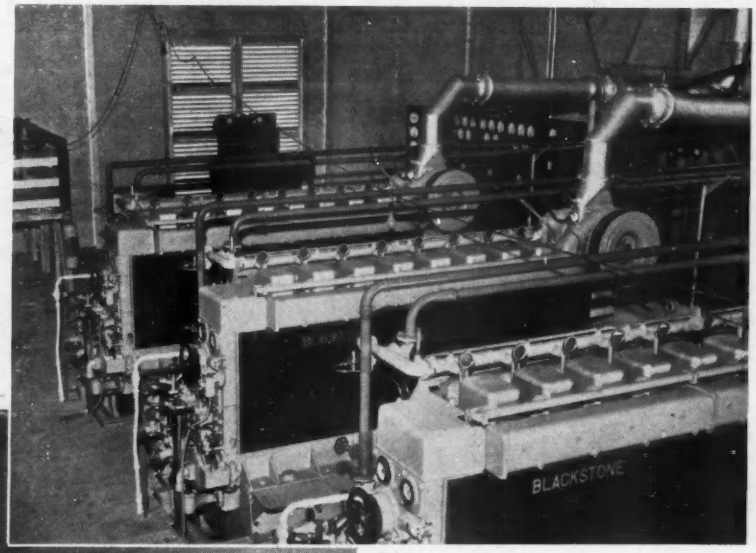
ADDITIONAL showground attraction and exceptional service to exhibitions are combined in a new transportable generating station which the organisers at the Bath and West Show were provided for the first time when the show opened at Exeter yesterday. Manufacturers have co-operated in the project, which provides 1,200 kW of power and a supply of hot water to stands.

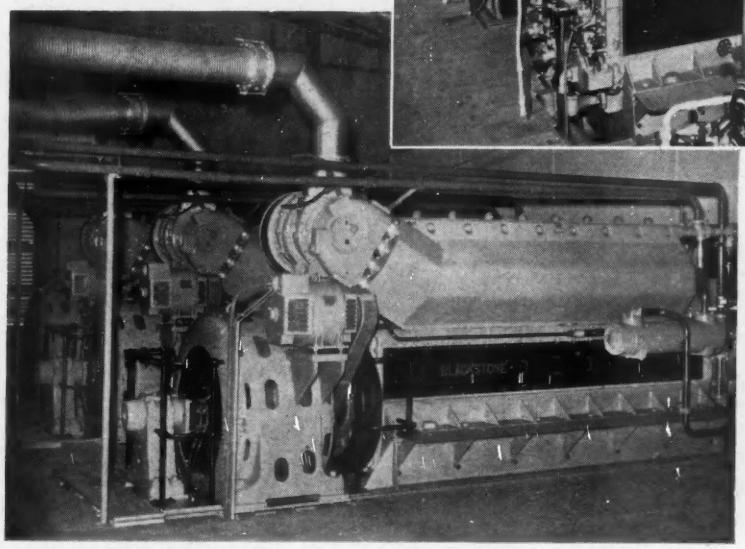
Three 400 kW diesel alternators supplied by R. A. Lister and Co., of Dursley, Glos, are at the heart of the station. Each set comprises a Blackstone ERSB diesel engine direct-coupled to an E.C.C. alternator rated at 500 kVA, 420/240 V, 50 c/s. Each set has a fabricated steel bed-plate, mounted on British Tyre and Rubber Co. insulators. The sets are transported in this form, and at the showground they are mounted on a common foundation consisting of a steel under-framework laid direct in the ground. It is interesting to note, in passing, that the framework used was originally constructed as part of the wartime Mulberry harbour.

The alternators have a frame-mounted exciter, vee-belt driven. Control equipment for all three machines is centred on a switchboard comprising three E.C.C. alternator control panels, two feeder panels and a synchronising panel. An automatic voltage regulator on each panel controls voltage to within 2½%. Remote-operated governors are fitted to the engines and operated by push buttons on the control panels. Frequency control is provided by an electrically-operated master clock and frequency meters, supplied by Gent and Co., Ltd. Main distribution to the showground and the stands starts at a distribution panel supplied by Ottermill Switchgear Ltd. Beyond this point, the complete distribution system and the wiring has been the responsibility of Drake and Gorham Ltd.

Diesel fuel oil for the engines is supplied from a Shell-Mex and B.P. Co. tanker stationed in a special enclosure outside the power house. The hot water for distribution round the showground, which has already been mentioned, is obtained from a heat interchanger in the engine cooling water circuit, a Drayton regulator valve providing control of the circuit, and determining the quantity of water going to the heat exchanger and the radiator respectively. Combined electricity and heat generation at nearly 70% thermal efficiency is expected under full load. Distribution of the hot water is by Dunlop rubber pipes, laid by a mole plough.

The power house, under an agreement between the show society and the co-operating manufacturers, will be available for at least the next five years. Plant is housed in a 65 ft by 47 ft by 35 ft high timber-panelled, fibre-glass insulated building, which is provided with an observation balcony open to members of the public.





Above is a view showing the engine end of the three Blackstone 400 kW diesel sets, on the left can be seen the E.C.C. alternators complete with their belt-driven exciters

Power Future of U.S.A.

MR PHILIP SPORN'S LECTURE TO THE I.E.E. ON PROSPECTS IN THE NEXT 25 YEARS

SOME comments on the future of electrical power in America and the research necessary to realise anticipated demand over the next 25 years, were given by Mr Philip Sporn in a lecture to the Supply Section of the I.E.E. last week. He emphasised that with the vital role electricity was playing it was essential to carry out long-term planning if there was to be an economic and adequate system of supply in the future. A number of national investigations had been made into future possibilities in the United States. The main facts at the moment were that in the past 25 years electricity production had increased some 300%, and consumption amounted to 3,250 units/year/head of population. The total demand on all the energy sources, both primary and secondary, was expected to double over the coming 25 years. The consumption of secondary fuels would, however, show a disproportionate increase, and of these electricity consumption would increase the most rapidly. He had made some computations taking into account all possible factors and it appeared to him that a yearly increase of 6·78% was possible. Other authorities had produced somewhat lower figures, and taking these into account 6·25% per annum was a reasonable figure.

This would imply an output of 2,000 billion (10^9) units annually from non-utility sources and 2,340 billion from utility. Turning to the fuel side, it was probable that the power generated by water would become much smaller in proportion, possibly representing only 10% of the total in 1978. Coal would therefore become the primary fuel as gas and oil reserves were too small. To generate the power required would need an installed capacity of 410,000 MW, consuming 525 million tons of coal annually. The question was—could such a programme be carried out, maintaining the existing economic and technical bases?

Research

Research should be able to make a substantial contribution to the solution of the problem. Three main lines of attack were of major importance: the growth in size of production units; problems of efficiency and size, and conservation of natural resources. Fundamentally in the period under review, the burden would fall on steam-electric-plant. Tidal, wind and solar power could only provide negligible contributions; water power would have a major task to provide over 10%; gas, oil, coal and nuclear power were the only other primary sources left, and coal would have to bear the major part. With an estimated consumption of 525 million tons in 1978, the problem of atmospheric pollution would become of great importance. Not enough was known about this subject and here research could help. Apart from providing chemical analyses of the coal reserves a further estimation of quantity was necessary. Underground gasification should be developed to provide a means of utilising the energy in thin seams which could not be normally worked. At the moment, coal in the United States was being confronted with a vigorous opposition and it might be difficult, unless plans were made now, for the industry to pick up the enormous future load.

On nuclear fuel, Mr Sporn thought that some time would elapse before it became significant. There were many technical problems in reactor design and operation which could only be solved by experience, and it was difficult to get the picture in clear perspective. The effect of atomic power in U.S. would be negligible for ten years, possibly slight in the following five and might have some significance after that. It should be remembered in this connection that there were abundant alternative sources of energy available in the United States.

Prime Movers

Until recently the future of prime movers was not clear; it seemed as far as temperatures and pressures were concerned, that the law of diminishing returns had come into operation. This had been altered by the decision to break through the critical pressure. Plant operating at 4,500 lb/sq in. was under construction and there were indications of trends to 7,500, 10,500 and even 15,000 lb/sq in. At the same time it might be possible to obtain temperatures 200 to 300° F higher than the present maximum. There was, however, need for much fundamental research both into the properties of steam and water at these conditions, and on suitable materials. The gas turbine must go higher in temperature than 1,500° F if it were to be applied to the mass generation of energy, and would have to be developed into a form where it would be suitable for solid fuel firing. The proposal that a gas turbine cycle could be allied to a steam cycle was one that was interesting but must wait on progress.

There were prospects in the fuel cell and in the photo-voltaic cell. In the former, the efficiency of the process was low although theoretical efficiencies of the order of 80% should be possible. A new version of the photo-voltaic type, based on semi-conductors, had given a 6% efficiency of conversion from direct sunlight to electricity.

Transmission and Distribution

Higher voltages would be required for transmission than ever before. Major problems to be solved included the suppression of corona and associated discharges. The barrier to high-voltage d.c. was the cost of the terminal equipment. It should be envisaged that eventually practically all heating and air-conditioning equipment will be electrically powered. The heat-pump would make a significant contribution here. But in other fields, electricity would also be utilised to the maximum.

Capital resources would also provide a problem, some 5,000 million dollars per year being required in electrical expansion alone. Could the American economy support this? And were there the engineers available to carry out the programme? There was no present answer to these points.

The vote of thanks was proposed by Mr J. Eccles, who referred to the astonishing fact that 540m tons of coal represented one-third of the world coal lift in 1952, and this was to be used in an area containing probably only 7% of the world population. Civilisations had come and gone because production techniques had not been matched to user techniques.

notes on wiring

by Megohm

IT would appear from recent observations that ever greater use is being made of steel trunking in installations. Trunking has many advantages over conduit and can now be obtained in many sizes to suit all types of installation requirements. It is usually supplied in lengths of 6 ft or 8 ft, and the necessary tees, flanges, reducers and bends are readily obtainable as stock items.

Cable Trunking System

One of the main advantages of trunking is that v.r.i. cables, which are too large to be drawn into conduit, can be easily accommodated. The I.E.E. tables of Capacities of Conduits show that no cables larger that 37/·072 can be drawn into conduit, and although 2½ in. conduit is still made, this size is more expensive to install that 2 in. by 3 in. steel trunking. With trunking, additions and alterations to the wiring are quite a simple matter. It is always an advantage to install a slightly larger size of trunking than is necessary for immediate requirements.

Trunking can be run either flush in the walls or on the wall surface, and, in the case of the former, I prefer the type which has the lid arranged to lie flush with the wall face. The lid can then be painted in to suit the wall decorations and can hardly be noticed. The lid should be arranged to fit between the walls of the trunking in order that the plasterwork can be finished tight up to the trunking. Certain types of trunking have the lid arranged to plant on to the edge of the trunking walls, and it is very difficult to make a neat plaster finish and an unsightly space between the lid and the plaster line is the usual result.

I.E.E. Regulation 406 deals with this system of wiring and states that the system shall comply with Regulation 315 (c) and such parts of Regulation 405 as apply. Special reference is also made in this Regulation to the earthing of metal junction boxes, covers and outlets. This is a very important matter when one considers the method of jointing the lengths of trunking together. This is usually done by four screws at each joint, but I have seen these screws, on occasions, badly installed or quite loose. It would appear to me that when the trunking is fixed to walls, it tends to pull out of truth and this causes any screws which have not been well fitted to pull out of line. The screws used at the joints also tend to work loose. There is a tendency for the continuity resistance to be slightly higher than the regulations permit due to this method of jointing the lengths of trunking together and also to the fact that the trunking is painted. Where the paint is scraped off at the joints to ensure good continuity there does not appear to be an effective way of preventing rust forming. I am in favour of some regulation covering the earthing of trunking and feel that a separate earth wire should be run throughout the entire length of run and bonded at one position, at least, in every 8 ft length of trunking. The manufacturer could easily arrange a suitable earth screw on every length of trunking. Many people will disagree with me on this matter, and point out that cables in trunking may be less subject to damage than those in conduit, but it must be borne in mind that in trunking systems, the final connections to the points, etc., are usually made in conduit and the possibility of an earth fault developing exists.

This leads me to comment upon the connection of conduit to trunking. Such connections are usually made with a coupler and male bush and, in my opinion, this does not provide sufficient earth continuity and I would prefer to see a form of strengthening strap incorporated at such positions which in turn would provide a means of clamping an earth wire between such a strap and terminating the earth wire in a clamp fixed to the trunking. This strap could be made in such a way that it could be fixed to the trunking where required.

It is also interesting to note that the I.E.E. Regulations do not provide any tables giving wiring capacities of trunking. I appreciate that it is very difficult to arrive at such tables because much depends on the loading of the cables and similar considerations. I do feel, however, that some guide should be prepared by the I.E.E., as even the manufacturers do not always give details in their catalogues. I think that quite a bit of guesswork goes into many trunking installations.

Vertical Trunking Runs

Where there are vertical trunking runs installed, pin racks can be fitted in the trunking to support the weight of the cables and the cables can then be fixed to the racks. These racks consist of pins, with insulated sleeves, mounted on a backplate which in turn is fixed to the trunking. These racks should be fitted at intervals of approximately 8 ft. Care must be taken with the larger-sized cables when threading them round the pins and overcrowding of cables in such situations should be avoided. Vertical runs which rise through floors must have fire barriers fitted inside the trunking at floor level. These barriers should consist of a non-inflammable material, cut away to allow the cables to pass through, securely fixed to the trunking.

Conclusions

I consider that trunking is an ideal system for the many installations where additions are likely to be made. Trunking, of course, like everything else has its limitations and where it is set flush into walls, some provision such as an adaptable box connected to the trunking should be installed, in order that an entry into the trunking can be obtained if additions are contemplated. One firm manufactures trunking which can be installed as a skirting board, but I feel that this type is more suitable for switch-sockets and bells, etc., than for lighting points. Regulation 315 (c) deals with the running of low voltage cables and states that these should not be run in the same groove, tube or casing as the cables for lighting and power. This is easily overcome by using trunking fitted with a partition. I have only quickly covered this matter of trunking and much more could be said and discussed if space permitted.

C.I.G.R.E — *discussion at the final sessions*

THE old question of which type of protection was the best was once again investigated at some considerable length in the session devoted to lightning and surges. And once again it appeared that no definite conclusion could be reached in view of the large number of factors which required to be taken into account. In the British system, as Mr Golde (G.B.) pointed out, earth wires were extensively used together with co-ordinating spark gaps, and it was most difficult to assess the absolute value of protection thus afforded. In arrestor statistics, such had been given in Paper 306, by Prof K. Berger, account should have been taken of the years of operation of the arrestors, as there was a tendency for them to absorb moisture over a considerable period of time. Dr Herlitz (Sweden) agreed that trouble had been experienced with moisture ingress in the past, but claimed that it had now been eliminated.

The virtues of single-phase reclosing were extolled by Mr Cabanes (France) who claimed that this system afforded better protection than earth wires, as, in addition to lightning, it could also cope with other surges. The economic advantage lay with single-phase reclosing on fairly long lines. Mr Csuros (G.B.) agreed that arrestors were justified in America and Sweden, but maintained they were not justified economically in Great Britain. The damage done by lightning to equipment represented a minute fraction of the cost of installing arrestors. Further, the 550 kV impulse strength for the 132 kV system could not be reduced by arrestors.

Mr Bodier (France) said that the cost of faults and of interruptions to supply had to be considered. On the medium voltage French networks there were various earthing systems and they had introduced three-phase reclosing. Some networks were self-extinguishing having Petersen coils, but he estimated that on the solid earthed system, using co-ordinating gaps, they had twice the faults that they obtained with high-speed reclosing.

Mr Ledoux (France) thought that much of the trouble with arrestors was due to bad specification on the part of the user. If sufficient attention were given to the selection of divertors it should be possible to reduce the failure rate to 2 or 3 per thousand operations per year.

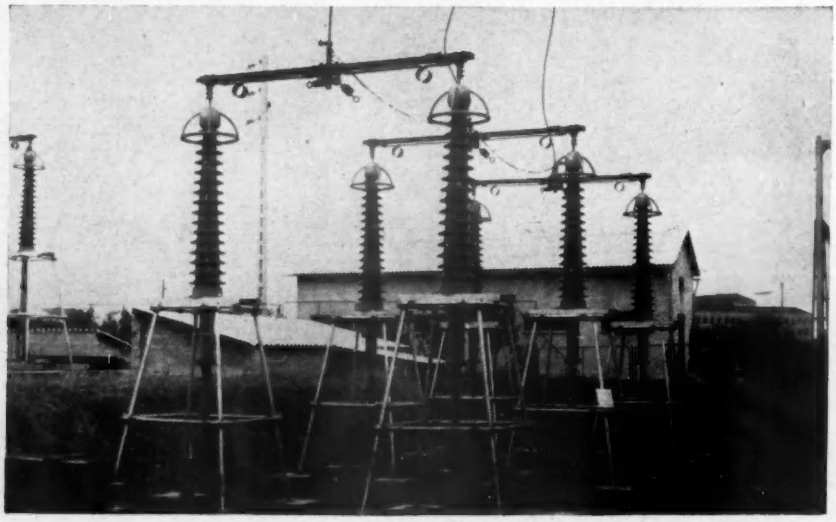
The placing of arrestors then caused some discussion. Mr Degoumois referring to transformer protection thought there were grounds for placing arrestors between phase and earth, in preference to phase and phase, as the phase-phase insulation was generally better. Mr Berger and Mr Hylton-Cavallius (Sweden), however, said there was little difference in insulation levels between phase-phase and phase-earth.

Measurement of tower-footing resistance, without disconnection of the earth wires, also occupied the meeting for some time, the principal topic being the accuracy of an electronic instrument devised by Mr R. Marenesi (Paper No. 329). Another electronic instrument of considerable ingenuity was described by Mr Martin (G.B.). This could record automatically the polarity and peak amplitude of surges occurring on a line. It produced a record in the form of a series of photographs (one for each surge) of meters and of time recording equipment, and could be left unattended.

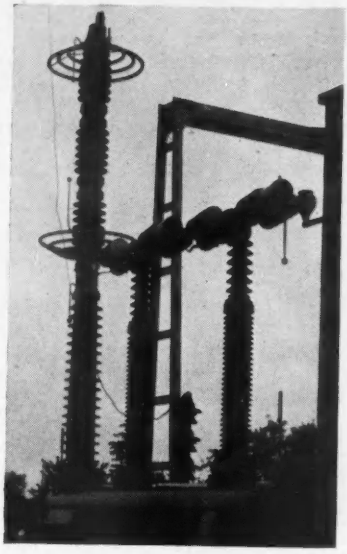
D.C. Transmission

Only three papers were submitted in this group, and two of these were concerned with the Gotland scheme.

This transmission system which commenced operation only a few weeks ago has many points of novelty besides being the first commercial d.c. project. Its use of the sea as a return conductor has presented special problems and the use of a radio link to control power flow depending on receiving end frequency is an unusual concept. The basic problem, however, has been the design of the inverters and



Cable sealing ends under test. The cables are oil pressure type made by S.A.C.M. and G.E.C. This is one of the installations at Fontenay where an extensive 220 kV cable testing area is in use



One phase of an Alsthom 250 kV, 11,500 A air-blast breaker

they passed a severe test in the first weeks when, owing to a shortage of water power on the mainland due to a late spring, the transmission system was inverted to carrying thermal power to the mainland. The same direction of current was maintained but the voltage was reversed. More detailed particulars are given in an article in this issue.

In addition to the paper by Messrs B. G. Rathsman and A. U. Lamm on the general system, a description of the 100 kV cable and its laying was given by Messrs B. Bjurström and R. Johansson, which was supplemented by a film. Of this perhaps the most spectacular feature was the haulage of the cable some two miles from the factory to the harbour. The cable was drawn along a special track laid alongside railway lines, through tunnels and over streets.

The third paper by Mr K. Nagai described Japan's interest in the possibility of d.c. transmission. Some 270,000 kW of water power resources are available on one of the islands if economically transmitted to the mainland while a second problem lies in the supply to certain small islands at present depending on thermal power. The paper was devoted to the design and operation of rectifier inverter sets, two of the more interesting proposals being a self-excited inverter set and a mercury arc frequency changer designed to link 50 and 60 c/s systems.

From the discussion it was clear that the cost of d.c. transmission is high, about £100 a kW for the Gotland scheme and Mr Miyamoto gave a figure of about £55 for a Japanese scheme; these figures, however, should be reduced when d.c. projects reach a commercial stage. Criticism of earth return systems on the grounds of interference with navigation by reason of the deviation of compasses was discounted. The effect is purely local and is unlikely to have any serious influence.

Interference

General questions of interference arising on other circuits —particularly those of telephone systems came under discussion on Saturday, 15th May.

In Sweden, due to the high earth resistance encountered, many difficulties had been experienced and Mr Jancke (Sweden) pointed out that it was impossible to reduce the earth current during short circuits. He thought that the present figures of field strength laid down by the C.C.I.F. needed to be doubled. The trouble would be increased in the future as short-circuit values increased. Mr Csuros (G.B.) thought that the methods whereby field-strengths were calculated were too complex, and sometimes led to results which were 5 to 10 times higher than the actual values measured in the field. Despite the fact that the British 132 kV network operated with earthed neutral, difficulties had never been experienced with telephone operators and subscribers being subjected to acoustic shock. Mr Maggi (Italy) pointed out that only a small proportion of lightning arrestor operations on the communication system could be attributed to the operation of the power network, and Mr Paimboeuf (France) considered that the problem of acoustic shock could be solved by the construction of powerful and sturdy lightning arrestors.

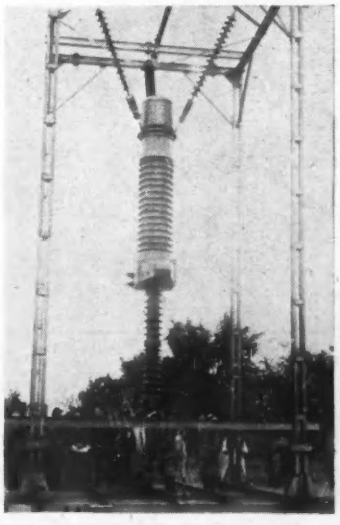
Turning to radio interference, Mr Martin (G.B.) stated that h.f. noise from lines was higher in fine than in bad weather, but at 100 metres from the line it was not more important than general atmospheric noise. This was confirmed by Mr Jancke (Sweden).

Rectifier harmonics also came under discussion, Mr Martin (G.B.) proposing a specification for the rectifier connections to produce an acceptable harmonic content to be put into the network. Dr Friedlander (G.B.), however, did not agree entirely with Mr Martin's proposals. After some additional comments by Mr Donkin (G.B.) and Mr Thompson (G.B.) it was concluded that further consideration on the harmonic question would be required.

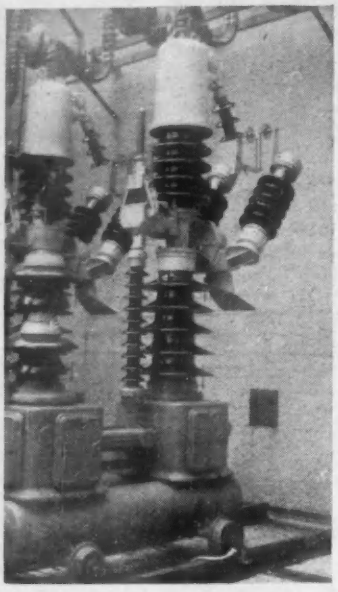
Relays and Protection

Here a paper arousing much interest was that by Mr G. Steeb (U.S.) who detailed a scheme for the protection of unit generator-transformer stations. The main feature of this paper was the reduction of the relays to a minimum, and the use of a single relay to carry out protection against differing types of fault. Mr Kaufmann (G.B.) opened the discussion by saying that more should be known about the operation of the dual function relay before a judgment could be made. In Great Britain a really satisfactory back-up relay had not yet been found. Mr Sviden (Sweden) preferred differential protection.

Doubt was expressed by Mr Casson (G.B.) on the correctness of Mr Steeb's assumption that the simplest scheme was necessarily the best scheme. A requirement of any protective system was that component units should be protected. Nevertheless there were many good features



A Jeumont suspended breaker 250 kV, 5,000 MVA



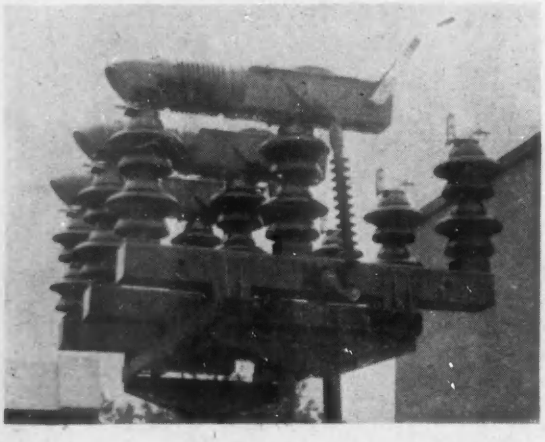
A Merlin and Gerin air-blast breaker for 70 kV, 65 MVA 1,600 A

about the paper, one being the use of polyphase directional relays. Single-phase types had been used in Great Britain in the past, but were now abandoned due to unnecessary trips. It might have been better had three-phase units been used. Mr Kennedy (U.S.A.) suggested that it might be better to use a separate device for each function, instead of a single device covering several functions. The latter case was essentially a compromise.

In the second half of the session, the problem of busbar protection came to the fore, Mr Szwander (G.B.) said he had always regarded busbar protection academically until he actually saw the the result of a busbar fault on a 33 kV system. Busbar protection should be provided on any new equipment. In generating stations the overcurrent relays did not often clear busbar faults as the decrement of fault current usually beat the protection and a phase-phase busbar fault remained unprotected.

Mr Kaufmann gave some statistics on faults and said that without doubt there was a need for busbar protection, and in this he was supported by Mr Kennedy who regarded the consequence of a busbar faults on large systems as most serious. He doubted the allegations of spurious and unnecessary trips, and maintained that using high impedance relays it should be possible to obtain a figure of about one unnecessary trip per 1,500 bus years. Mr Gray (G.B.) said that the high impedance relay was much more manageable from the designer's viewpoint. Questions of relay design and standardisation were also discussed, particularly from the viewpoint of interchange of cases and components.

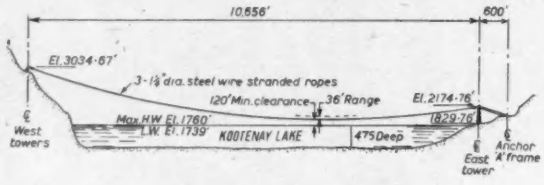
A Delle special breaker for 500 A at 70 kV



Stability

Somewhat unexpectedly the first topic which came under discussion was that of network analysers and in connection with these Mr Baur (Germany) described a machine similator which could be used in conjunction with a conventional analyser. Mr Mortlock (G.B.) said that some attention had been paid in Great Britain to this subject. The main object was the elimination of step-by-step methods. The usual technique was to assume power and torque to be synonymous and to use two integrators in series. By using the analoque of $\frac{1}{2}$ $CV^2 = \frac{1}{2}$ Iw^2 a speed function could be simulated electrically. This in turn allowed a damping term to be introduced. Excitation variations could also be dealt with by a simulator that was under development. He also emphasised that when purchasing an analyser, caution should be taken that it was suitable for the subsequent attachment of machine simulators, soon to be available.

A cheap impedance-type analyser was described by Mr



Profile of the Kootenay Lake crossing

Adamson (G.B.). This machine had been developed for the Southern Division. Mr Gosland (G.B.) thought there was a wide field for a cheap simple and slow analyser in special cases. There was far more use for digital-type machines than was generally imagined. A comment on simulators and a description of some of the work being done at Imperial College, London, on analysers was given by Mr Humphrey Davis; who showed some photographs of the instruments. Mr Powell (G.B.) made a plea for the use of d.c. analysers and boards. Considerable work, he thought, was being carried out by expensive a.c. machines using step-by-step methods, which could more easily be done on a d.c. machine.

On series capacitors, Mr Horsfelt criticised a Japanese paper and wanted to know how the dielectric paper had been improved. Mr Coursey (G.B.) said the two types of spark-gap used in protection of series capacitors on overhead lines provided a different dielectric stress in each case. He maintained that metallised paper was not suitable for h.v. work. Mr Frisant (France) commented on the "amplification" of voltage variations produced by series capacitors which, he thought, could be most annoying for the user.

Towers and Foundations

The need for greater economy in the design of towers was again stressed and the special reporter M. I. D. Zetterhold (Sweden) raised the familiar question of designing towers to withstand broken conductor conditions and the discussions gave support for allowing towers to deform under such conditions. The view was perhaps best summarised by Mr De Bianchi. Every user should decide for himself the risks he must take and he should not be restricted by national regulations.

An interesting new type of tower was described by Mr

W. von Mangoldt (Germany) of the concrete-filled steel-tube type. The distinctive feature of this design is the spinning of the concrete within the tube to provide compacted concrete with good adhesion to the inside of the tube; the thickness being limited to reduce weight. This construction provides long members for tower construction with an economy claimed of 30—40% in steel and from 10 to 14% in cost.

The unusual conditions of construction in Finland were shown in a film illustrating the erection of a 200 kV line some 300 miles long. Owing to the swampy nature of the ground, most of the work was carried out in winter to permit the use of tractors, and prefabricated foundations have been used. The towers are of the portal type with stay wires along the axis of the line. This introduced discussions on the merits of stays and the chairman, Mr J. Jobin (Switzerland), asked for more information on their use to be presented at the next C.I.G.R.E. A paper on the Messina crossing was also promised by Mr Bianchi for the next conference.

A Swedish paper which concluded that the portal-type tower was more economical than the corset tower was challenged by Mr Percival (G.B.) and Mr Bianchi. It was suggested that the particularly corset type of design was not the best on which to base a comparison and this experience in Sweden does not apply in other countries.

Two papers, one from Italy and the other a combined German-Swiss effort described experimental work on tower foundations. Both, however, refer to the need for further work on the subject but substantial progress is being made.

Overhead Lines

The extensive studies of loading conditions of overhead lines have led to the acceptance of lower values, leading to more economical lines. There seemed general agreement however that still further savings should be possible. From Sweden came a paper by Messrs O. D. Zetterholm and S. Tandin pointing out that although wind gusts are a factor of design loadings investigation has shown that they are narrow fronted and do not extend the full width of the span. They use an effective wind pressure on the cables equal to 25% of that on an equivalent rectangle. Similar stories of the justification of lower loadings come from France and Great Britain with the warning that such conclusions do not necessarily apply to other countries. Wind loadings it would seem are matters to be settled on a zonal basis. Ice loadings are more difficult of determination.

In view of the growing use of bundled conductors a German conclusion by Messrs H. Mors, K. W. Baer and M. Erich states that they have a reduced tendency to oscillate and thus an increased margin of safety. Similarly, in the British 275 kV design described by Messrs D. P. Sayers, F. J. Lane and J. S. Forrest the assumed maximum angle of swing was reduced from 45° to 30°.

In addition to the previously mentioned paper on the British grid two Canadian papers attracted special attention. One by Messrs A. A. Defoe and F. L. French described the Kemano-Kitimat 300 kV line in British Columbia which is particularly noteworthy for the largest aluminium steel conductor yet made. This consisted of 37 x 0·1261 in. steel and 108 x 0·1765 in. aluminium with an overall diameter of 2·29 in. and because of the difficult terrain it led to special problems in stringing. The other paper by Mr E. M. Stiles described the two mile crossing of Lake Kootenay also in British Columbia. The profile is illustrated and if the cliff on the left facilitated tower design it certainly added to the complication of stringing. A nice economy of design is shown by the use of a single tower on the right bank and three short separate towers on the left, giving greater conductor separation.

Passivated Transformer Oil

A MAJOR STEP IN THE FIGHT AGAINST OXIDATION

IT has been known for some time that contact with certain metals, particularly copper and iron, accelerated the oxidation of mineral oils, and four years ago the Manchester Oil Refinery began research into the metal content of used oils. It was found that transformer oils, which had only been in service for a few weeks had doubled their sludge-forming potential—as measured by the Michie (B.S. 148) test—due to the presence of a soluble copper content of less than 1 p.p.m.

Work was then started to develop oils which would not dissolve copper. When this had been done, the next step was to produce oils which were not sensitive to copper in solution, and finally an oil was made which was unaffected by the presence of copper or iron, whether as solid metal, or as a solution of the metal in the form of a "soap" or a salt of an organic acid. The resultant "passivated" oils oxidises much more slowly than the present types when used in transformers switchgear, capacitors and cables, and can in consequence be used for far longer periods before the development of sludge or acidity makes them unfit for further service. Even at higher temperatures they have a reasonable life.

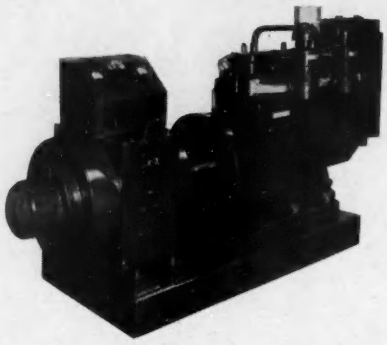
It is particularly significant that M.O.R. Passivated Transformer oil, except for its additive content, more than meets the specification requirements of most European and overseas organisations, and with the increasing use of additives, it is probable that most organisations abroad will be prepared to accept the oils with additives. The additives used are small quantities, below 0·25% by weight, of organic chemical compounds containing nitrogen, and the oxidising rate is about one-fifth the rate of normal oils. The hydration operations, such as filtering through adsorbents, do not remove the additives providing the adsorbents used are mild such as fuller's earth or activated carbon.

COMPARISON OF RESULTS IN NATIONAL OXIDATION TESTS

Type of Test	M.O.R. Standard Oil	M.O.R. Inhibited Oil	M.O.R. Passivated Oil
British (B.S.148)			
Sludge (% wt.)	0·80	0·40	0·08
Acidity (mg KOH/gm)	1·00	0·55	0·20
Swiss (SEV)			
Sludge (7-day) (% wt)	0·10	0·10	0·015
Acidity „ (mg KOH/gm) ...	0·25	0·25	0·06
Swedish (SEN)			
Sludge (% wt)	0·10	0·10	0·01
Acidity (mg KOH/gm)	0·60	0·50	0·10
German (Baader)			
Saporification value (mg KOH/gm)	0·25	—	0·05
German (Kissling)			
Tar number	0·09	0·09	0·08
ASTM (D670-42T mod)			
100° C/92 hrs/10 p.p.m. sol Cu			
Sludge (% wt)	0·10	0·08	0·02
Acidity (mg KOH/gm)	0·55	0·45	0·13

Taking Power to the Outposts

DIESEL GENERATING SETS FOR EXPORT



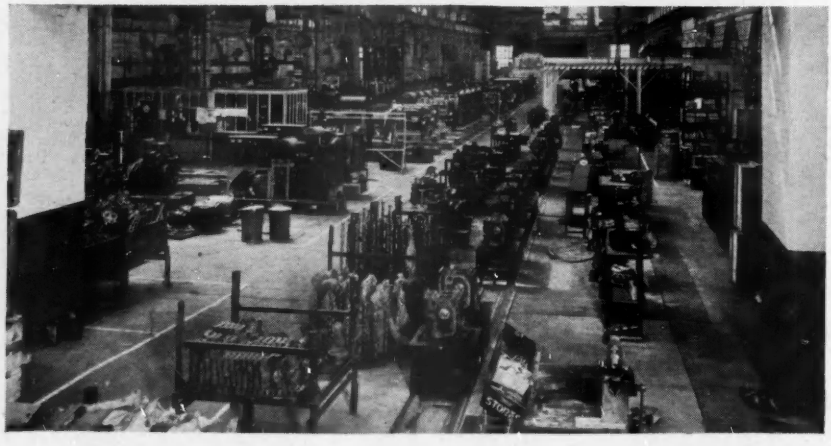
FOR outlying districts in overseas countries, remote from the main centres of population, the engine-driven generator set affords the only means of obtaining a supply of electricity. For hospitals, farms, households and other establishments so situated, J. and H. Maclaren Ltd. are now commencing the large-scale production of diesel alternators ranging from 1¼ to 25 kW in size, particularly suitable for those places where skilled labour is not readily available. Marketed under the name of "Brabo," the sets employ Petter diesel engines made by Maclaren or their associate Brush Group company, Petters Ltd., driving "Square Path" alternator produced by the Brush Electrical Engineering Co., Ltd., at their Cardiff works. Approximately 100 "Brabo" sets have been in operation since the units were introduced about a year ago, the promising results of their operation on site together with those from extensive factory tests having led the company to introduce them on a large scale.

A recent visit to the Airedale Works, Leeds, of J. and H. Maclaren afforded an opportunity to see the sets being assembled and demonstrated. Interest was primarily centred in the larger units of 12½, 18 and 25 kW, the engines for which are made at these works, although the smaller sizes, 1¼, 3 and 6 kW were also on show. Production and assembly follow largely a flow-line pattern. Crankshaft casings are received as rough castings for machining, boring and drilling which is performed on automatic or semi-automatic machine tools interconnected by rollers mounted at working level to minimise handling between each operation. Finished casings are then transported to the assembly line on which the engine is assembled, mounted with its alternator on a common bedplate, tested, given a protective coating of paint and crated.

Engines used for these three larger sizes are the Petter, Type B2, B3 and B4 series, vertical, cold starting, water-cooled, totally enclosed, four-stroke units, having two, three or four cylinders. Direct injection combustion is employed, the piston having a hemi-spherical bowl in its upper surface. Like the crankcase, the cylinder head is of cast iron, of monobloc construction and carrying multi-hole injectors. A centrifugal governor controls the engine speed to comply with B.S. 649:1949.

Driven through a flexible coupling, the "Square Path" alternator, which was described in the ELECTRICAL TIMES of 14th May, 1953, is of the revolving armature type. It is inherently self-exciting and self-regulating, effected by incorporating, within the armature slots used for the alternator windings, d.c. generator/motor windings which are brought out to a commutator. The d.c. machine not only provides the main and auxiliary alternator fields, but, with series field windings in the 1¼, 3 and 6 kW sizes, acts as a starting motor. The brushes for the auxiliary alternator field are set at 90° (electrical) from the main brushes, thus giving an output only on load, when armature reaction moves the magnetic axis of the main field.

The larger sets are available in five versions—hand start, remote stop; remote start and stop; fully automatic; local electric start, remote stop; automatic start for mains failure duty. In the fully automatic version, the set is started up when a load of 60 W or more is applied to the alternator output. All control equipment is mounted in a separate control panel. Two stages of overload protection are provided. Up to 15% overload relays in a.c. and d.c. circuits switch a resistance in and out of the auxiliary field circuit; causing the output voltage to rise and fall and thus giving immediate indication on lamps and appliances that the set is overloaded. Above this figure the fault relay operates, opening the main contactor circuit which cuts off the main field, and fuel supply to the engine. The sets can be operated under tropical or arctic conditions.



Petter "B" engine assembly line looking from the input end. Machined crankcase castings can be seen in the foreground. In the heading is seen the 25 kW set in which the prime mover is a B4 engine

Potentialities in Uganda

TECHNICAL PAPERS ON THE OWEN FALLS SCHEME

TWO papers, presented last week, filled in the details of the Owen Falls Hydro-electric scheme, which we described briefly in our issue of 6th May. The first of these, by Sir Charles Westlake, R. W. Mountain and T. A. L. Paton, was given at a joint meeting of the Institutions of Civil and Electrical Engineers. It began by outlining the developments which led up to the final construction of the Owen Falls scheme. Investigation at an early stage had indicated that the whole of the available waterflow could be utilised economically, and consequently plant having the capacity to absorb all this should be installed. However, facilities at the port of Mombasa and transport limitations were such that the maximum size of set which could be handled was fixed at 15 MW. This implied in turn an unusually long power house containing ten 15 MW units. The hydraulic conditions were such that Kaplan turbines were chosen in view of their somewhat higher speed than the Francis type.

The first task of the contractors was to arrange for accommodation for the staff and artisans. Their major problem, however, concerned the diversion and control of the river during the building of the main dam. Doubts were raised as to the stability of coffer dams, should the river reach its maximum flow of about 43,000 cusecs. However, the Ripon Falls, some distance upstream provided the means of a satisfactory solution. By temporary blocking these, it was found possible to regulate the flow to a maximum of 26,000 cusecs. This enabled the work to go ahead, and despite the presence of some deep scorings on the river bed, and the discovery of a large pocket of gravel—which resulted in the resiting of the power house itself some 90 ft upstream—the construction proceeded closely to schedule.

When the generating plant was ordered in 1948, no definite scheme could be developed for the transmission system, but at that time it was thought that the greatest load would develop in the vicinity of the power station. A 33 kV network was, therefore, envisaged. It was, however, borne in mind that later developments would be accompanied by the necessity for long-distance transmission at 132 or even 220 kV. The alternators were, therefore, designed with this possibility in mind, and provision was included for their operation as synchronous condensers should need arise. These requirements made necessary the provision of excitation control equipment with a high rate of response, and which would also maintain stability under fault conditions; in consequence the electronic system described in our issue of 6th May was developed.

The need for high-voltage transmission for a large block of power had already arisen and in consequence only the first four alternators were being connected to the 33 kV busbars, the remainder would be connected, through 11 kV switchgear and transformers, to the 132 kV busbars.

Economics of the Scheme

Since the date of the decision to proceed, the costs of all essential materials and labour had risen greatly. It might be said that the cost was about twice the original estimates. It was, however, confidently expected that the revenue, by 1962, would reach an amount necessary to cover all expenditure, including interest on capital. Much of the town planning in Uganda was, from a town-planner's point of view, excellent, but little attention appeared to have been paid to the economic provision of public services. In a new housing development in Kampala of about 1½ square miles, the Board had 602 consumers. The cost per consumer of the high and low voltage distribution averaged about £75. The cost of European staff and labour was very high, and the expense of maintenance substantially increased in that all electrical and mechanical material and equipment was imported from the United Kingdom.

Since 1948, the revenue to the Board had increased considerably from £43,000 to £555,600 in 1953 and it is expected that in 1954 it will be about £700,000—and this has been achieved before the commencement of supply to any of the major industries now envisaged and of the proposed bulk supply to Kenya.

The tariffs at present in use in Uganda were based on thermal generation which had a relatively low-fixed charge and a high-unit charge. However, it was proposed that for hydro-power, bulk supply and metallurgical supply would be offered on a kilowatt or kilovolt-ampere year basis, with no unit charge. Most of the industrial development would involve power for electric-arc furnaces and electrode boilers, and cost of power should be kept as low as possible.

The second paper, presented to the I.E.E. Supply Section by Messrs J. M. Stock and J. C. Lithgow went into a more detailed analysis of the economic factors involved in the scheme, but in addition gave details of the turbines, alternators, auxiliary services, switching station and control room. An interesting section of this paper dealt with transmission. Nairobi was slightly more than 300 miles from Owen Falls, and a preliminary study carried out on a system analyser, indicated that a load of 40 MW could be transmitted by a double-circuit 132 kV line with 0·125 sq in. (copper equiv.) s.c.a. conductors; providing 40 MVA of synchronous condensers were installed. Ample provision had been made in the 132 kV substations for future expansion, and the 132/33 kV step-down transformers were star/start connected with delta tertiaries so that if, in the future, they were moved to the end of a long line, it would be possible to connect them easily to synchronous condensers.

DISCUSSION

OPENING the discussion on the Paper by Messrs J. M. Stock and J. C. Lithgow, MR R. W. MOUNTAIN (Kennedy and Donkin) paid a tribute to the leadership given by Sir Charles Westlake to everyone connected with the scheme over the last seven years. He commented on the fact that some of the transmission lines had double earth wires, some single earth wires and some no earth wires at all.

MR W. D. FENTON (N. of S. Hydro-Electric Board) said that whenever a hydro-electric scheme was put forward there were always a great many people who contended that it was uneconomic. When the Uganda scheme was completed it appeared from the figures given that the price per unit would be about 0·3d. when working to maximum capacity, which was about half the price in the North of Scotland schemes.

MR C. O. BOYSE (B.I.C.C.) expressed disappointment that so little had been said in the paper about transmission and distribution. In a large area with widely dispersed loads the economics and the design of transmission and distribution lines required careful study, and the conditions were in complete contrast to those existing in this country.

MR H. NIMMO (Southern El. Bd.) commented on the use of ten 15,000 kW sets at Owen Falls, and referred to a scheme in a remote part of the north of Sweden in which three 105,000 kW sets had been installed, the sets being built in sections to facilitate transport. In 1962, he said, the cost of the Owen Falls scheme might work out at £126 per kW, but it would still represent a very sound investment.

MR R. L. CHANTRILL (B.T.H. Export Co.) remarked that he had been connected with at least ten similar projects in the Indian sub-continent, and in every case it had been necessary to face bitter criticism by reputed experts who claimed that there was no foreseeable load and therefore no financial justification. Careful load surveys had been made, and in every case the actual load proved to be appreciably greater than the estimate, but in every case the loads actually obtained had been unforeseen in the planning stages. With all the projects a period of up to thirteen years had been expected before they became financially balancing, but the longest period experienced in practice had been about five years.

MR P. L. BLACKSTONE (Merz and McLellan) said that the physical size of many hydro machines now being built precluded any possibility of transporting them in a semi-assembled state, and it was necessary to waive shop erection and running tests and carry out complete erection on the site. That was being done in the United States and Canada almost as a routine for large plants.

DR J. H. MORTLOCK (B.T.H.) said that even the somewhat pessimistic load growth figures given by the authors meant that by 1962 a second station would be required, and by 1968 a third. He understood that there were sites for five stations, the sites being about four miles apart, so that there might be difficulty about the machines sharing megavars correctly.

DR J. H. WALKER (B.T.H.) gave further particulars of the alternators installed at Owen Falls. Sir Charles Westlake, he said, had insisted that in the alternator design there should be no cheeseparing of any kind. The guaranteed temperature rise was under 60° and on test was found to be considerably less.

MR D. J. BOLTON (B.E.A.) said that, taking the scheme as a whole, he was staggered by the boldness of the conception. While the authors had current practice on their side in taking an 80-year life for the civil engineering works, other means of generation—possibly by atomic energy—might well alter the situation.

MR J. G. PARK (Eastern El. Bd.), who had been a member of the hydro-electric mission which visited East Africa in 1946, said that the whole scheme had rightly been described as an act of faith. He wondered whether any plan was in mind to electrify the railway from the coast. At present all the fuel oil and coal had to be brought up from the coast. Even before the war the fuel cost/engine mile had been 1s. 1·8d., and must now be more than double that figure.

SIR CHARLES WESTLAKE (Uganda El. Bd.) said that twenty years ago he had presented his first paper to the Institution as Chief Engineer of the Electricity Board of Northern Ireland. His estimates of demand had been criticised at the time as the workings of a disordered brain, but they had been fulfilled and in fact exceeded. When he went to Uganda to prepare a load survey he found a very different situation. In Northern Ireland there had been 70 plants already operating, including several large municipal undertakings; when he got to Kampala he found two small power stations with three different boiler pressures and four different voltages of generation. Unfortunately at that time it was held that there was not an adequate load to justify what seemed now the trivial expenditure of some £3 millions.

When he went back in 1947 he was determined that a power scheme should be started, and he found that 20 MW of load could be collected in the next five or six years. His estimates in total proved to be remarkably accurate, but, as Mr Chantrill had said, it was another story if one examined the components of the demand.

Inspection Council Proposal Rejected

A PROPOSAL to seek the establishment of an Independent Inspection Council, with statutory powers to deal with electrical installation work, was turned down at the annual Policy Conference of the Electrical Trades Union at Margate last week. The Union's Executive Council explained that the contractors did not consider the expenditure which would be involved worth while. The delegates also defeated, on the advice of the Executive Council, a proposal for the registration of all electrical operatives.

Wages, productivity, redundancy and the supply industry position, were among other matters discussed. Redundancy was the subject of a comprehensive motion from the Tooting branch which asked the Executive to establish a policy dealing with dismissals. It was suggested that no dismissals should be effected without a full inquiry by employers and union representatives; union officials, the motion suggested, should be given the right to inspect the firm's books to check the need for dismissals.

The motion also recommended co-operation with other unions to meet unemployment problems and called for an agreement with employers to draw labour from union sources. The branch, in tabling the motion, admitted that there were difficulties in the policy. The Executive Council pointed out that there were, in fact, contradictions in the suggestions made but they agreed to examine the proposal and it was remitted for consideration.

The conference agreed to a motion, put forward by the Southampton branch, calling on the Government to give priority to the building of new generating equipment, and possibly, to use the powers given under the Electricity Act to manufacture plant, after Mr J. Snaddon, for the Executive Council had declared that it was vitally necessary that they should have freedom to develop the supply industry. The problem was caused to a great extent by the Government's capital expenditure and export policy.

Unanimous support was given to a call for a 40-hour week in all industries, after some members had pointed out that it would also help to combat redundancy. After appearing on the agenda for seven years without success a motion calling for a national rate for all electricians was carried by 172 votes to 153 against the advice of the Executive Council. Delegates who claimed there was little difference between prices in London and the Provinces were told by the general secretary, Mr W. C. Stevens, "to be realistic." Their leaders, he said, had already reduced the number of different rates paid and at the same time had followed a policy of extending the area of London rates. He pointed out that on the union's own calculations they had found that rents and transport, the two major items, showed that there was justification for a differential of 2½d. an hour in favour of London. His advice was not taken, however, and after the vote the President, Mr Frank Foulkes, commented "All you have to do now is get the national rate."

It was agreed unanimously to press for a superannuation fund for all workers to be provided by the employers out of profits. The union backed the recent stand made by the Boilermakers Society on local productivity committees and declared unanimously that "participation is not in the best interests of our members."

The last item before the conference was sick-pay and a resolution calling for a union sick-pay scheme for contracting members was withdrawn. Mr R. G. McLellan said they wanted a sick-pay scheme which would come out of the pockets of the employers, and had indicated at the last meeting of the National Joint Industrial Council that they were still pursuing the matter and would continue to make that demand.

Winding Stators for small motors

MECHANICAL HANDLING REDUCES OVERHEADS

SOME fifty years ago Mr Ernest Brook founded the business which has now become Brook Motors Ltd. Opportunity was taken in the celebration of the jubilee of the firm to open formally the company's new factory at Barugh Green, Barnsley, where stators for motors are wound. The range is from fractional sizes up to about 5 h.p. The frames with stampings pressed in are brought by articulated truck from the main works at Huddersfield, sets of coils are wound and inserted, the windings are tested and then impregnated in insulating varnish and baked. They then go back to Huddersfield for assembly.

The most important feature of the factory is the attention which has been paid to material handling and the reduction of paperwork. This has principally been accomplished by the introduction of an electronically-controlled conveyor system. Three of these systems are in operation, the original design being for five parallel winding conveyors each having 37 winding positions.

Each winder has a number, and a spring-loaded table at her station is connected to indicator lights on a central panel in the production control office, which maintains a supply of materials to the winders. No stator is supplied to a winder unless all the material for the completed job is available. The system is designed to ensure that while a winder is working on one stator in her manipulator, she will be provided with a reserve unit which stands on the spring-loaded table. When this reserve unit is moved on to the manipulator, the red light in central control lights up, and a further job is despatched to her. The clerk selects a work ticket, marks her number on it, and passes the ticket to the stock department. At the same time he presses a button on the control panel which operates a green indicator light to show that action has been taken. A stator, together with a tray containing windings, insulation, terminal box, etc., and the ticket is then put on a conveyor belt, and travels to a central indexing station, where a controller diverts the assembly to the appropriate secondary transport winding conveyor. By means of selector switches, the work is then dispatched from this secondary station, and a timing device ensures that it stops opposite to the winder who has been selected. The timing is started by a photo-electric cell on the winding conveyor. It is impossible to re-start the conveyor until the winder

Three conveyor lines are at present in operation but a further two are planned. Here a further job awaits collection by a winder

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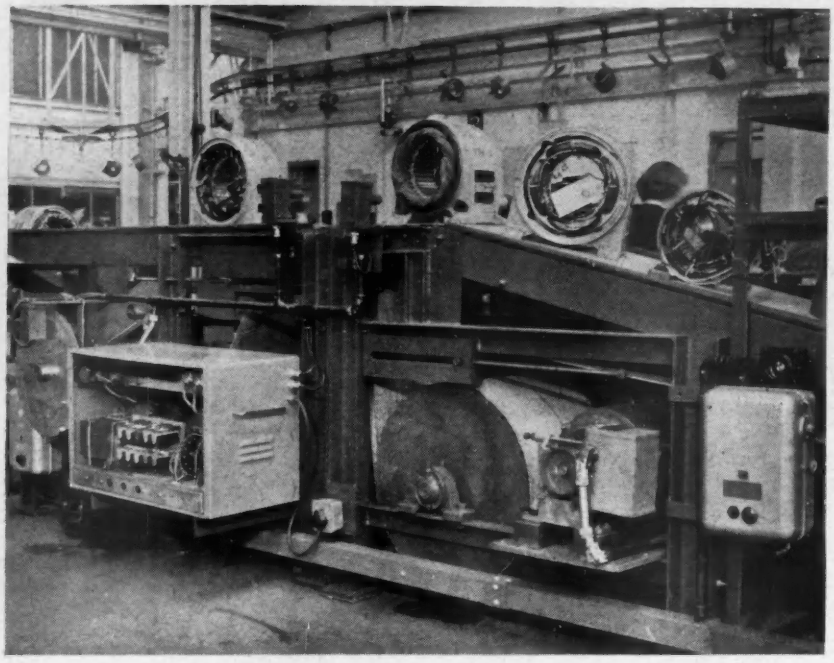


The automatic counting mechanism on the conveyor control

slides the job from it, to the spring-loaded table. This action frees the conveyor and extinguishes the lights on the control panel.

The winder slides the finished work to a lower conveyor which takes it to the connecting positions. It travels up a small ramp conveyor until it reaches another photo-cell which stops the conveyor until any one of the connectors needs a stator. The conveyor to the connectors is operated by the same process of spring-loaded table and photo-cell as the winding conveyor, but is entirely automatic in operation. An automatic finder constantly checks round all the connecting positions: immediately one of the spring-loaded tables is released, a stator is automatically started on its journey from the conveyor, stopping at the connecting position from which the signal was received.

Advantages of the System

The problem of motor production lies in the vast number of mechanical and electrical types. There are some 30 different stators to be handled with 500 variants of winding and voltage, combined with 10 possible speeds.

The manipulators are such that the girls can easily handle the stators and it is estimated that production overheads have been reduced by 20% by this technique.

Stimulating Sales in Malaya

WITH a considerable improvement in the power generating capacity position, the Central Electricity Board of the Federation of Malaya has been able to turn from power restrictions to the holding of exhibitions to stimulate the sales of domestic appliances and thereby the sales of electricity. The change in the power situation has been brought about by the commissioning of the first half of the Connaught Bridge power station in March 1953. In the annual report of the Board for the year ended 31st August last, it is stated that it is expected that the station will be fully loaded before the end of this year, and that the second 40 MW section, to operate next year, will be well loaded by 1958.

The Board is, therefore, planning the erection of another power station near Malacca which could, if an immediate start were made, be in commission by 1958. The possibility of utilising the Cameron Highlands hydro-electric potential is, again, under consideration, as we have already recorded.

Discontinuing its simple hire scheme, except for ceiling fans and water heaters, the Board has launched a hire-purchase scheme for domestic consumers, which is producing satisfactory results. The total number of units sold during the year covered by the report amounted to 208·2 millions, an increase of 13·64%, of which dredges and mines accounted for 90·3 millions and other industrial power users a further 48·5 millions. Domestic light and power consumption was 35·8 million units, an increase of 25·69%, and an indication of the success of the Board's promotional activities. A further 7,242 consumers were connected during the year, making that total at the end of August last year 66,768.

The Board now operates two steam power stations, two hydro-electric stations, and 34 diesel stations. These generated 226·7 million units, and in addition, 32·4 million units were purchased from other undertakings. The generation cost per unit sold fell from 4·80 cents in 1951-52 to 3·94 cents for the past year, due to the greater efficiency of the newly commissioned steam generating station at Connaught Bridge and a decrease in the cost of fuel, particularly diesel oil. Generating expenses were actually $500,000 less than for the previous year.

Apart from the additional generating plant commissioned, the year covered by the report also saw the birth of the Malayan National Grid with the commissioning of the double circuit 66 kV interconnector between Connaught Bridge and Bungsar power stations and the 66 kV transmission line south to Seremban (43 miles) and Malacca (90 miles). The extension of the line to Batu Pahat and Kluang in the south and to Malim Nawad in the north is being contemplated. The Board has also been given the special task of providing security lighting in 180 new villages throughout the country, some of them in the most remote and inaccessible areas. Despite the difficult and often dangerous conditions prevailing 106 of those supplies were completed by last August and work was well advanced on the remainder. In this matter the Board has been actively assisted by the Kinta Electrical Distribution Co. (a subsidiary of the Perak River Hydro-Electric Power Co.) and Huttenbachs Ltd.

Vast Potential Market in Middle East

U.K. TRADE DELEGATION PUBLISHES ITS FINDINGS AFTER LAST YEAR'S TOUR OF FIVE COUNTRIES

THAT British electrical manufacturers should direct special attention to markets in the Middle East, is probably the briefest yet most important recommendation contained in the report of the U.K. Trade Mission to five countries in that part of the globe. The Mission travelled under the leadership of Sir Edward Benthall and visited Iraq, Kuwait, the Lebanon, Syria and Saudi Arabia in November and December last year. Included in the party of eight was Mr D. Maxwell Buist, export director of B.E.A.M.A.

As in most parts of the world today, one of the major items in the development programmes of all the countries visited is the need for a more plentiful supply of electricity. Existing supplies are either inadequate or non-existent, and consequently if development is to take place, as it certainly will, more power stations will have to be built, and there can be no doubt that over the next ten years there will be considerable expansion. Happily Britain possesses almost everything which these nations require. It should be remembered that there is no competitive local manufacture, and none of the import restrictions and licensing difficulties so prevalent elsewhere.

Ten Year Demand

Taking each of the countries in turn, the first and probably most important from the electrical industry's viewpoint is Iraq. There electricity development will probably grow at such a rate that for many years to come there will be a considerable demand for all classes of plant and equipment for generation, transmission, distribution, industry and domestic use. The Iraq Development Board is now embarking on a plan to provide about 60 localities with their own diesel-driven generating plant, but this is only a small preliminary step prior to the large-scale projects awaiting the results of a Power Survey now being conducted for the Board by a firm of American consultants. At present the Baghdad Light and Power Co.'s steam station can carry a peak load of 28,500 kW with one of its largest sets out of commission. This safe load will be exceeded by 1957, by which time an additional supply will have to be available either from a new oil-fired steam station or alternatively from a hydro-electric station at the Samara Dam in the Wadi Thartha flood control project on the River Tigris.

The speed of development in Kuwait during the past 25 years is now world-famous and the expansion of electricity supply clearly exemplifies the pace at which it has been carried out. A new steam station of 30,000 kW capacity is now being built and is due for commissioning this year. Plans have been passed for extending this station by a further 40,000 kW to cater for the expected growth of industrial and domestic load over the next ten years. There will be considerable demand for air conditioners, refrigerators, fans and other domestic appliances, radio receivers and lighting fittings for housing schemes, hospitals, hostels and public buildings, together with cables, overhead lines and substation equipment.

Internal and international disputes appear to have retarded electrical progress in the Lebanon, but once these are settled there is no doubt that rapid expansion will take place with the consequent heavy demand for plant and equipment, and especially domestic appliances. Among a large number of schemes propounded is the Litani river project estimated to produce 100,000 kW. Pending a decision on that scheme however, a concession has recently been granted for the development of Lake Yammouna and the River Orontes, which will together yield some 20,000 kW.

German Competition

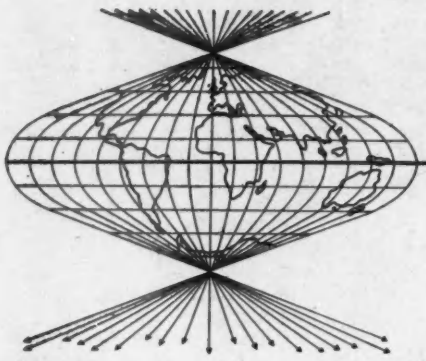
Development in Syria and Saudi Arabia continues steadily, although at a comparatively slower pace. Probably the most important factor concerning these two countries is the remarkable increase in continental competition. In Syria that competition has made more headway than in the other countries visited; not surprising considering the fact that cut prices and extended credit have a predominating influence. Germany has been most successful and has overhauled the U.K. in the export field. The market for electrical commodities in Saudi Arabia holds good promise. British prestige is high but again German competition is achieving results.

Thus the market for electrical goods in the Middle East appears to be assured for many years to come and it seems unlikely that any enterprising manufacturer will ignore these countries. There are, however, numerous general considerations to be borne in mind. The Mission has warned that competition is going to be very keen. Britain has had it more or less her own way in the past but the U.S. and the Continent are stepping in. One of the recommendations made to meet this need, and it was strongly emphasised, was that directors and senior executives of intending exporters to the area should make frequent visits. Visits are necessary, the report states, both for maintenance of goodwill, for proper selection of agents, and for a proper appreciation of the markets.

U.K. Trade Fair

Special emphasis was also laid on the British Trade Fair which is to take place in Baghdad next October. The Mission strongly recommends that British manufacturers support this Fair. It is the first to be held in the Middle East and will be attended by representatives of all nations from Turkey in the West to Malaya in the East.

Among other recommendations was the advice that the F.B.I. should consider establishing offices in the principal cities, and that a standing business committee on the Middle East be established in London on the lines of the India, Pakistan, Burma Association. A wider distribution of British Standards Specifications in the countries concerned was also recommended. Finally, the Mission met with numerous complaints that business was being lost because of extended credit facilities offered by competitors. It recommends a further examination of credit facilities available. Commenting on this advice after the report was published, Mr D. Heathcoat Amory, Minister of State at the Board of Trade, said that certain relaxations had been made and it was found that U.K. exporters were not badly handicapped at the present time.



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Alberta Scheme

Calgary Power Ltd. is seeking approval of a plan to build a dam on the lower Kananaskis lake at the Pocaterra site to raise the water level of the lake 39 ft. This additional water would permit an extra 18,500 h.p. to be developed. Cost of the scheme is put at $3½ millions, but the local Fish and Game Association has raised objections on the grounds that it would spoil the beauty and recreational value of the lake.

More Power for Vancouver

Work is now in progress on the construction of the 104 mile long 345 kV line from Rosedale to the Bridge River No. 1 transmision line at Pemberton by the British Columbia Power Corporation Ltd., Mr A. E. Grauer has reported. It is to connect with a similar line from Rosedale to Greater Vancouver which the company completed last year. Mr Grauer also reports that a damsite has been found on the Cheakamus River, where a plant capable of developing about 190,000 h.p. is envisaged. The site has the advantage of being able to use the Bridge River No. 1 transmission line to Vancouver.

Electrification on P.E.I.

The question of further rural electrification on Prince Edward Island, has been the subject of recent discussions between the Government and the Maritime Electric Co. The latter earlier reported to the Government that it estimated there were 1,100 miles of line to be built with an average of 4·5 consumers per mile. The company suggested each local group requiring power should organise into a non-profit service concern with the company providing the electricity. But this proposal the Government has rejected. It has now been agreed that the Government will provide rural extensions and service transformers, the consumer providing the service line from the government extension. Announcing this, the Premier has said that a further 61 miles of line is to be erected. Since the major power company in the province was not prepared to own lines, but to supply power to lines owned by the Government, it was felt that the lines should be built by the Government at a cost to be supervised by the Public Utilities Commission. In addition the company would do a considerable amount of work on its own account. In the twelve months ended 31 March, 1953, 38½ million units were generated in the province, over 30 millions being provided by the Maritime Electric Co.

PORTUGAL

Another Station Operating

The first of the two 61 MVA 15·5 kV generating sets at the Cabril power station of the Hidro-electrica do Zezere in Portugal was commissioned on 20 May last. This fulfilment of the original programme for putting the first set into service last month is a considerable achievement on the part of the Hidro-electrica do Zezere and the contractors. The dam, which is 433 ft high, is one of the highest in Europe, and the generating sets are amongst the largest installed. The mechanical and electrical equipment has been supplied and installed by the two British companies, the English Electric Export and Trading Co. and Metropolitan-Vickers Electrical Export Co., Ltd. This group also supplied similar equipment at the Castelo do Bode Power Station about 43½ miles downstream of Cabril on the Zezere River. The turbines each have an output of 74,800 b.h.p. at the maximum head of 397 ft approximately and the generators give 61 MVA as a maximum continuous rating. The three-phase transformers are rated at 61 MVA 15·5/165 kV. There are two generator transformer circuit-breakers and one feeder breaker, each of the airblast type, for 165 kV.

AFRICA

Work at Lusaka

Work is proceeding on the construction of the new power station at Lusaka, Northern Rhodesia, which it is hoped will be in operation by the middle of next year. The station is to have two 5,000 kW generators installed, but one set will probably act as standby initially.

A Warning

Commenting on the controversy now raging concerning whether priority should be given to the Kafue or Kariba hydro-electric projects, Mr MacIntyre, Minister of Finance in the Central African Federal Government, last week said that continuance of the dispute might lose the Federation's goodwill with international source of finance. He also deprecated the parochial outlook of certain participants in the arguments.

BURMA

One H.E. Scheme

Following our note last week (page 794) on plans for a number of power projects in Burma, we now have news that a group of British firms have been entrusted with the preliminary investigation into the power potentialities of the Pyaung Sho Rapids on the Namtu River, near Maymyo. The firms in the group, we understand, are English Electric Co. Ltd., George Wimpey and Co. Ltd., British Insulated Callender's Construction Co. Ltd. They have retained Sir Alexander Gibb and Partners as consultants.

RUSSIA

Power Production

The Soviet Union plans to increase its hydro-electric power production to 80% above the 1951 figure, it was stated by the chief Soviet delegate to the United Nations Economic Commission's Conference on the development of water resources in Asia and the Far East, to which we referred last week. Total power production in the U.S.S.R. in 1953 was 133,000 million kWh, he stated.

AUSTRALIA

Good News of Morwell

Work is to be resumed next October on the Morwell project of the State Electricity Commission of Victoria, but with priority for production of power instead of briquettes. This news has been given by Mr Galbally, the Minister for Electrical Undertakings. The power plants at Morwell, originally intended for use in briquette production, will supply electricity to the State power system, and the briquetting factories will be in operation at a later date. The Morwell project was halted by cuts in the loan funds. Under these revised plans, it is estimated that by January, 1958, 42 MW will be available, but no briquettes. By 1959 there should be 66 MW of generating capacity

for public supply, plus the first briquetting factory producing 714,000 tons of briquettes a year. In the following year generating capacity would amount to 91 MW, and briquette production to 1¼ million tons. The original plan provided for only 36 MW of generating capacity. The extra 55 MW is to be obtained for an additional expenditure of about £2 millions for a low pressure condensing turbo-generator plant to utilise surplus exhaust steam normally used for coal drying. Mr Galbally said the commission was faced with the necessity of placing orders for new power plant which must be operating by 1959 to meet the growth in demand. By the use of generating plant already delivered or on order for Morwell, it would be possible to defer any commitments on Yallourn "E" extension for a further two years.

W.A. Extensions

New electricity schemes to supply nine towns in Western Queensland, are shortly to be put into operation, it has been announced by the State Minister for Mines, Mr Riordan. The towns are Texas, Tambo, Bollon, Morven, Augathella, Yuleba, Capella, Injune and Normanton. Cost of the schemes is about £250,000. The supply to Texas and Tambo should be available this month, and at Bollon in July.

Snowy Problem

It is still not yet certain whether Victoria wants to take a proportion of the power to be available from the Snowy Mountains hydro-electric project. Mr W. Hudson, the Snowy Mountains Authority commissioner, last month disclosed that Victoria must soon make up its mind what power it wanted from the scheme. To this, Mr Galbally, Victoria's Minister for Electrical Undertakings, has replied that Victoria was not against the Snowy project, but like all large undertakings, it had to stand the test of proper examination and financial scrutiny. Mr Galbally said that no one would be more pleased than he and the Premier, Mr Cain, if power could be produced more cheaply from the Snowy scheme than at Yallourn. At present Victoria was producing electricity from brown coal more cheaply than anywhere else on the Australian mainland. It would save him financial headaches in building big power stations if the Snowy scheme could undercut the cost of production from brown coal. He added that Yallourn was operating seven days a week, 24 hours a day, but the Snowy scheme would run only five hours a day. These were facts that had to be faced up to.

NEW ZEALAND

Maraetai in Full Operation

The fifth and final generator at the Maraetai power station on the Waikato River, was put into operation at the beginning of last month by the New Zealand State Hydro-Electric Department. With a capacity of 180 MW, Maraetai is New Zealand's largest hydro-electric station—at least until the Roxburgh scheme in the South Island is in operation. The station first began to feed power into the North Island grid on 31 Oct., 1952, when, under a reduced head, one machine was put into commission. The second generator was added on 4 Nov. and the third on 13 Nov. The level of the water behind the dam was raised gradually between 11 Mar., 1953, and 28 June of that year, when the three machines then installed were able to operate at full head. The fourth generator was added on 12 Jan. of this year, and it has now been followed by the fifth. Maraetai is the third station to be put into full commission on the Waikato River, and within a few miles of it are the 100 MW Whakamaru station and the 63 MW Atiamuri plant, both of which are under construction.

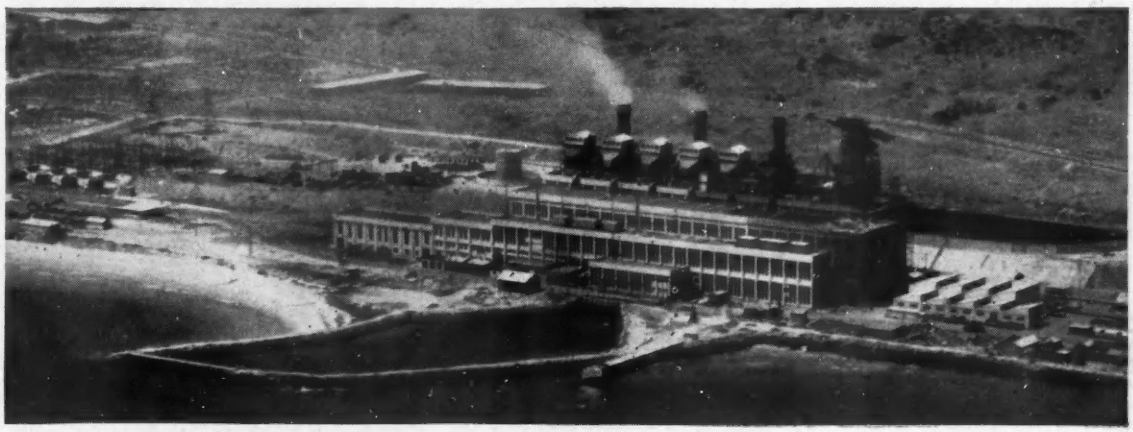
Loan for Extensions

Approving the recommendation of its consulting engineer, Mr L. Mandeno, the Taupo Borough Council, New Zealand, is to seek a further loan of £48,000 for completing work in hand, and further extensions to the power network. Mr Mandeno's report showed that output of the plant was about 17,000 units in Jan. 1953, but with the reduced tariffs the output for last Jan. was 93,400 units. He estimated that earnings a year hence should reach about £20,000 per annum. It was therefore apparent that the undertaking was already on a sound financial basis, for invested capital as yet was under the amount of the total authorised loans of £156,500.

A Good Year

Revenue from the sale of electricity by the Marlborough Electric Power Board, N.Z., during the year ended 31 Mar. last was 15% higher than for the previous year, although the number of units sold, 18·5 millions, was only 7·6% up. An amended tariff applied from 1 July, 1953. The Board operates a hydro-electric station at Benopai on the Waihopai river and a heavy oil engine plant, in addition to taking a bulk supply from the State Hydro-Electric Department. The hydro station, operating continuously, generated 7·4 million units and the oil engine station 2·2 million units — both increases, whereas the bulk from the State Hydro-Electric Department, at 11·8 million units was about the same as in the previous year. The Board now has over 6,000 consumers.

The "B" section of the South Fremantle power station of the State Electricity Commission of Western Australia is rapidly nearing completion, as our photograph below shows. It is a duplication of the "A" section which was put into commission in May 1951. When completed the station will contain four 25 MW Metropolitan-Vickers turbo-alternators and eight International Combustion boilers of 150 klb/hr, 600 p.s.i., 800° F. rating, burning pulverised coal delivered by rail from the Collie coalfield. The intake basin built in the foreground feeds the circulation water system, avoiding the objection of having large culverts going out into deep water. The water taken from the Indian Ocean, incidentally, is usually between 10° and 15° lower in temperature than the river water at East Perth. The station, which is about 15 miles from Perth, was designed by Mr W. H. Taylor, M.I.E.E., the Commission's former general manager and chief engineer



Personalities IN THE INDUSTRY

On behalf of the employees of The North Eastern Electricity Board, the deputy chairman, **Mr T. M. Ayres,** M.I.E.E., made a presentation in Newcastle on Wednesday of last week to **Mr H. H. Mullens,** B.SC., M.I.E.E., who relinquished the chairmanship of the board on 31 May to become managing director of A. Reyrolle and Co. Ltd. The presentation took the form of a cinematograph camera. In the course of his remarks, Mr Ayres paid tribute to the talents of leadership which Mr Mullens had displayed since taking office in 1948, when the electricity supply industry became nationalised. Appreciation was also expressed at the way in which Mr Mullens had shown every consideration to the Board's employees. Mr Mullens, in his reply, thanked the large gathering of employees for the gift he had received and said that the arduous duties he had been called upon to carry out had been greatly eased by the support so readily given by the staff. He regarded it as a privilege and pleasure to have held the office of chairman.

Mr W. D. Buglass, ASSOC.I.E.E., of the India Stores Department, has transferred from headquarters in London to the Manchester area as inspecting engineer, electrical, as from this week.

The new president of the Electrical Contractors' Association for the ensuing year is **Mr A. F. Plummer,** M.C., ASSOC.I.E.E., managing director of the Shoolbred Electrical Co. Ltd., who serves on the I.E.E. Wiring Regulations Committee and various sub-committees. Mr Plummer was educated at Mill Hill School and Leeds University. After war service with the R.E.s, he had a short spell in the hat industry at Luton before joining the old established electrical contracting firm of Shoolbred and Connell in 1926. He has been managing director of Shoolbred Electrical Co. Ltd. since its formation in 1930, and recently joined the board of the Midland Electric Installation Co. Ltd, of Wolverhampton. Joining the E.C.A. in 1938, Mr Plummer has been chairman of the Beds. and Herts. branch since its inception in that year. He has served on the London and Home Counties Sectional Board since 1943, during which time he has served as vice-chairman and twice as chairman. Serving on the E.C.A. Council since 1944, he has been on the Executive Committee since 1946, and was vice-president from 1950 to 1953. He was also chairman of the E.C.A. Technical Committee from 1944 to 1950. In addition, Mr Plummer is a founder member and past-president of the Luton Electrical Society and the Luton Civic Society.

Higgs Motors Ltd. have appointed **Mr G. L. Hankey** as their technical sales representative for the South Wales area. His early education was undertaken in Germany and he completed his electrical training at the College of Technology, Manchester. During the war he served in the Royal Corps of Signals, rising to the rank of captain. Since leaving the Army he has been engaged on the sale of electric rotating machinery in the Midlands and South Wales Area and leaves the Brush Electrical Engineering Co. Ltd. to take up his new appointment.

At the annual conference of the Electrical Contractors' Association of Scotland held at Rothesay recently, **Mr R. D. McCraith,** electrical engineer, of Castle Douglas, was appointed president of the Association in succession to **Mr R. A. Smith,** managing director of Lowdon Bros. and Co. (Engineers) Ltd., Dundee. Mr McCraith has been prominent in electrical contracting circles in Scotland for many years and has devoted much time and energy to the affairs of the Association. Following service as chairman of the Dumfries and Galloway sub-branch, he was appointed chairman of the Glasgow and West of Scotland branch of the Association in 1951 and was elected vice-president of the Association in the following year. Mr McCraith commenced his electrical apprenticeship with Crompton and Co. at Chelmsford and after experience on installation and plant maintenance in Dumfries and elsewhere, was appointed engineer of the Castle Douglas Electric Light Co. in 1931. Two years later he commenced business on his own account in Castle Douglas and some years ago opened a branch of the firm's business in Lockerbie. The firm has carried out many important contracts in the Dumfries and Galloway areas.

As from 1 June, the Stevenage and Letchworth Districts of the Eastern Electricity Board have been merged into one district, now known as the Stevenage District, with headquarters at 38 High St, Stevenage. Appointed district manager of the new district is **Mr H. L. Sumner,** who held a similar post at Letchworth.

Mr R. H. Halls, formerly district commercial engineer at Letchworth, takes over a similar post for the new Stevenage district. **Mr M. G. Bidnell,** district commercial engineer of the old Stevenage district has been appointed the electricity service manager at Letchworth, operating from the Works Road address.

Mr Victor C. H. Creer, M.A., a director of the British Thomson-Houston Co., Ltd., has been elected Chairman of the Council of the Electric Lamp Manufacturers Association for the twelve months commencing 1 June, in succession to **Mr C. J. W. Scott,** of Crompton Parkinson. A war-time administrative officer at Ministry of Economic Warfare and later at the Air Ministry, Mr Creer subsequently became widely known to executives in the electric lamp industry as deputy director of Lamp Production at the Ministry of Aircraft Production, and the Government authority on the production of electric lamps. He joined the B.T.H. Co., in 1945, and was appointed director, lamp and lighting sales in 1948. He is also a director of two companies associated with B.T.H.—Glass Bulbs Ltd., and Lamp Caps Ltd.

Mr A. F. Plummer

Mr G. L. Hankey

Mr R. D. McCraith

Mr H. L. Sumner

Mr Victor C. H. Creer

Mr Ian T. Morrow, C.A., F.C.W.A., deputy managing director, the Brush Group, was installed as a vice-president of the Institute of Cost and Works Accountants at the Institute's annual general meeting last week-end.

The Ministry of Fuel and Power has appointed **Colonel Sir Stuart Mallinson,** C.B.E., D.S.O., M.C., D.L., J.P., to be a part-time member of the Eastern Electricity Board.

The English Electric Co. Ltd. have made three new appointments to the demonstration team of the Domestic Appliance Division. They are **Miss Rita Baxendale,** formerly with the Merseyside and North Wales Electricity Board in Birkenhead, **Miss Yvonne Doel,** who was lately with Hoover Ltd., and **Miss F. Kay Whittington,** previously with the Merseyside and North Wales Electricity Board.

Mr A. Potts, divisional export manager, Hoover Ltd., and **Miss Muriel Cowan,** export washing machine consultant, of that firm, last week left for a four weeks' business tour of the Belgian Congo.

As he will be 70 years of age in July next, **Mr S. B. Rogers** has intimated that he proposes to retire from the chairmanship of Sangamo Weston Ltd. at the end of this year.

Brook Motors Ltd. announce the appointment of **Mr G. M. Shepley** as secretary of the company, in place of **Mr Willie Mills,** who has resigned his secretaryship owing to ill health but remains on the board of directors. Mr Mills joined the firm almost fifty years ago when the business was situated in Colne Rd, Huddersfield, and became the secretary in 1910 and a director in 1914. Mr Shepley, who joined Brook Motors Ltd. in 1949 as export manager, was previously with Martins Bank Ltd., with whom for many years he was employed in the Foreign Department.

Mains superintendent at Wigan to the North Western Electricity Board, **Mr J. Derbyshire** retired last week. He had worked at Wigan for fifty years.

Regarding our note last week concerning the appointment of **Mr W. H. McFadzean,** C.A., to succeed Sir Alexander Roger as chairman of British Insulated Callender's Cables, we should make it clear that Mr McFadzean, who was previously deputy chairman and chief executive of the company, was born in 1903 and is thus 50 years of age. The forerunner of B.I.C.C. was, of course, British Insulated and Helsby Cables Ltd.

Mr W. R. Gledson, B.SC., T.D., governing director of J. Gledson and Co. Ltd., and a past-president of the Electrical Wholesalers' Federation, was last week elected president of the Newcastle upon Tyne Rotary Club for the golden jubilee year of the movement.

The name of the successor to Lt.-Col. Hardie on the board of Globelite Industries Ltd. is **Mr A. H. Topham,** C.B.E., and not as we stated last week.

Mr H. Frith unveiling the bust of Mr Ernest Brook, founder of Brook Motors Ltd, whilst Mr Frank V. Brook, chairman, looks on at the jubilee commemoration ceremony to which we referred last week

Managing director of Westool Ltd., **Mr A. L. Hunking** has been elected chairman of the Tees-side District Advisory Committee of the Northern Regional Board for Industry.

The address of **Mr R. W. Allen,** B.SC.(ENG.), A.M.I.E.E., the North East area representative of Nife Batteries, is now "Westbourn," Darras Rd, Ponteland, Northumberland.

After 48 years with the firm of Handcock and Dykes, consulting engineers, **Mr C. W. Smith,** M.I.E.E. has retired and is now living in the Isle of Wight. Educated at Kingston-on-Thames Technical College and the City and Guilds College, Finsbury, he was with the Kingston-on-Thames electricity undertaking before going to Weybridge to serve as charge engineer with the Edmundsons Electricity Corporation Ltd. He was later chief assistant to Handcock and Dykes, and was taken into partnership in 1936. He has advised on all matters concerning the generation, transmission and distribution of electricity. During the last war he was on the staff of the Director of Electrical Engineering, Admiralty, at Bath.

The Donovan Electrical Co. Ltd., announces the appointment of **Mr R. H. Varnom** as sales manager of their Division in succession to the late **Mr A. E. Boyce.** Mr Varnom will continue to be in charge of the sales from Birmingham of the company's standard manufactures of the switch-fuse and motor control gear.

Following the transfer of the resistance welding business of British Insulated Callender's Cables Ltd. to Metropolitan-Vickers Electrical Co. Ltd., **Mr A. H. Lawson,** M.ENG., who was responsible for the welding machine department at Prescot, has now joined the Metropolitan-Vickers staff at Trafford Park as sales engineer. Mr Lawson, after graduating at Liverpool University in 1930, served a college apprenticeship course with Metropolitan-Vickers. His connection with welding commenced in 1937 when he joined the staff of British Insulated Callender's Cables Ltd. in their experimental welding section.

Mr R. F. Tomlinson has been appointed a lamp and lighting salesman at the Manchester office of the British Thomson-Houston Co. Ltd. in the post recently held by **Mr J. E. Sutton,** who is now senior lamp and lighting salesman at the company's Newcastle-upon-Tyne office. **Mr D. J. Gunn** has joined the B.T.H. Manchester office this week as lamp and lighting salesman to cover the territory previously handled by **Mr L. Caldwell.** A further addition to the company's Manchester office is **Mr N. Marland,** who recently joined it as junior lamp salesman.

Mr J. MacKenzie, of the Edinburgh firm of MacKenzie and Moncur, was elected president of the Association of Heating, Ventilating and Domestic Engineering Employers, at the annual conference last Thursday.

Alderman J. H. Bingham, a part-time member of the Yorkshire Electricity Board, was last week inducted as Lord Mayor of Sheffield.

OBITUARY

Mr A. C. Bailey, ASSOC.I.E.E., senior assistant engineer (meters, testing and protection) in the No. 3 (Sheffield) subarea of the Yorkshire Electricity Board since 1950, died on 20 May. Mr Bailey received his early training with the Westinghouse Co. Ltd., and joined the Yorkshire Electric Power Co. in 1920 as assistant test engineer. From 1930 until vesting date he was in charge of the Test Section of the Yorkshire Electric Power Co.

Mr W. F. Marsh, production director of British Driver-Harris Co., Ltd., to whose death on 20 May, aged 62, we briefly referred last week, joined that company in January, 1929, to take charge of the foundry. When the main factory was moved from Manchester to Cheadle before the war he was mainly responsible for its layout and organisation. He was appointed to the board of directors in May, 1945, and only last April it was announced that he was to be a director of a new company, Driver-Harris Iberica, S.A., formed for the process and marketing of alloys in Spain and Spanish territories.

Mr W. F. Knowles, a Liverpool radio dealer, died on 26 May whilst on the Philips' Mediterranean cruise.

Mr A. J. Sturgeon, managing director of Foster Electrical Supplies Ltd., and a director of Foster Transformers Ltd., died on 26 May, 1954, aged 66. Mr Sturgeon's association with the Foster organisation commenced in 1911 and he became actively connected with the lamp world through the Electric Lamp Manufacturers' Association in which the company did much pioneer work. When in 1944, due to the greatly expanding business of the Foster organisation it was decided to form Foster Electrical Supplies, Mr Sturgeon became the first managing director and held that position until his death.

Equipment for Industry

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Circuit-breaker Dis-boards

FOR the smaller power industrial sub-circuits, and commercial and domestic heating or lighting installations, WALSALL CONDUITS LTD., Excelsior Works, West Bromwich, Staffs, now supply a circuit-breaker distribution board. Of the ironclad type, it is marketed under the name of "Wal-break" and is available in four, six or eight ways.

Designed to carry its full load indefinitely, the circuit-breaker is the free dolly type, a bi-metal strip operating at 100% overload with a time delay of approximately 30 secs. Instantaneous protection is afforded by a magnetic trip release operating at approximately 60A, the design of arcing chamber enabling the breaker to be used under arduous operating conditions. Variation of the full load range from 10 to 15 A is provided, an indicator being incorporated. Provision is made to lock each breaker in an "off" position before tracing a fault. After elimination of the fault, the circuit is closed by moving the dolly to the "on" position.

Wiring is facilitated by the construction of the board, the circuit-breaker assemblies being mounted on a separate, internally hinged plate which may be swung outwards for access. The neutral connecting bar is fitted at the bottom of the back of the box. The case is in cast iron with steel end-plates provided with knockouts for conduit entry, finished in French grey or galvanised.

Cable Fault Location

WITH a series of instruments now manufactured by the CAMBRIDGE INSTRUMENT CO., LTD., 13 Grosvenor Place, S.W.1, the engineer is equipped to locate earth faults directly on power cables operating at up to 50 kV. All of the direct reading type, the complete series includes a l.t. localiser suitable for pressures up to 600 V, giving at this voltage an accuracy of 0·1% on earth faults up to 20,000 ohms resistance, a high tension localiser, and an L-C localiser for use on open circuits together with a self-contained Wheatstone bridge suitable for Murray and Varley loop tests.

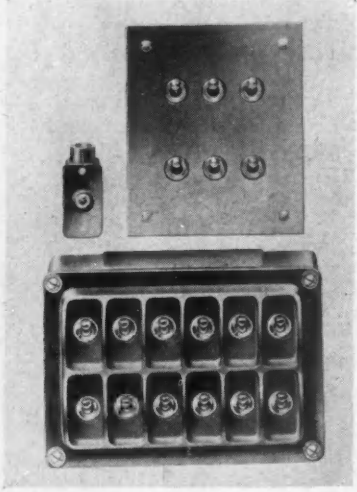
Both low and high tension localisers incorporate two calibrated dials in place of the slide wire for the Murray loop test to simplify reading and improve accuracy. The resistances associated with the dials are so arranged that when the bridge circuit is balanced the sum of the dial reading gives the distance to the fault as a percentage of the length of the section under test, not as a fraction of the total loop length. For the open-circuit faults an audio frequency bridge is used measuring either capacitance or inductance. Where the insulation resistance to earth at the fault is high the capacitance circuit is used, but where it falls below 100 ohms the inductance bridge circuit is employed. The instruments are fully described in the company's information sheet No. 297.

Ironclad Switch Assemblies

FOR engineers concerned with industrial installations, the SIMPLEX ELECTRIC CO., LTD., Broadwell, Oldbury, Birmingham, have recently announced the introduction of a new range of ironclad switch assemblies. Comprising one to twelve gang s.p., and one to eight gang, d.p., assemblies are of small dimensions, of neat appearance and designed for all normal industrial requirements. Cover arrangements include protected dolly, surface, finish, B.M.A. chrome, insulated and moulded types.

In all units other than those with moulded plates, Lundberg 5 and 15 A a.c. only switches with brass dollies are used, the foregoing exception being moulded dollies. A totally enclosed switch movement ensures freedom from dust and moisture. Boxes are supplied complete with switch supports, accepting any of the covers available. Pillars are used in one and two gang s.p. and single gang d.p. boxes, the remainder being fitted with adjustable grid type switch mountings. Principles underlying the construction of this new range can be economically applied to multiple units with neatness and compactness.

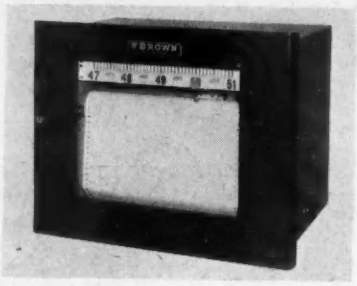
These examples show the neat appearance of the Simplex switch assemblies



Recording Power Frequencies

FOR 50 c/s service is a 12 in. strip chart frequency recorder recently introduced by HONEYWELL-BROWN LTD., 1 Wadsworth Rd, Perivale, Middx. It incorporates a number of interesting features by which instantaneous measurement of frequency can provide a continuous check of generator performance. Based on the "continuous balance" principle of the company's "ElectroniK" potentiometer, the recorder is designed to meet all requirements of central station power systems, whilst interchangeability of parts minimises maintenance costs.

Apart from its large and easily readable indicating scale, with the advantage of a wide chart, this new "ElectroniK" recorder is available with a pen speed of 18 or 30 secs., according to requirements. Having a wide linearity range, its accuracy is stated to be ± 0·01 c/s, independent of the harmonic content of the supply voltage, and its response unaffected by normal ambient temperature variations. The frequency portion of the measuring circuit may be connected to a low burden line,



Honeywell-Brown 12 in. strip chart recorder for 50 c/s service

whilst the remainder of the instrument receives its power from the normal instrument power supply.

Donovan's New Relays

A RECENT addition to the range of control gear manufactured by the DONOVAN ELECTRICAL CO., LTD., Safuse Works, Stechford, Birmingham 9, is a series of power relays which have considerable application for remote control of heating, or small power circuits. Known as the R.700 series, they are available with two, four or eight poles in open, or enclosed versions. Double break, silver coated contacts are employed having a non-inductive current rating of 10 A for either version. In terms of motor size, the relay is capable of controlling a 1½ h.p. single-phase or 2 h.p. three-phase motor on 200/250 V supplies and a 3 h.p. three-phase motor on 400 or 550 V supplies. Its maximum pressure rating is 550 V. Each size is available in any combination of contact movements from, in the 8 pole size, all eight contacts opened on operation to all eight contacts closed. This latter model can be supplied with one change-over auxiliary contact as an extra, and the smaller models with two such contacts. Cases are of sheet steel or aluminium, bonderised or pyluminised respectively before painting.

Now—the Creda "Star"

INTRODUCTION of a new low priced cooker—the Creda Star, is announced by SIMPLEX ELECTRIC CO., LTD., Creda Works, Blythe Bridge, Staffs. In spite of its low price, the Creda Star is beautifully styled and includes facilities not usually regarded as part of the standard equipment. Two models are available, the 305 and the 310, and they can be supplied either on a plinth or on legs. The only difference between the two models is that the 310 includes a 6¼ in. boiling plate as well as an 8 in. plate and a grill boiler.

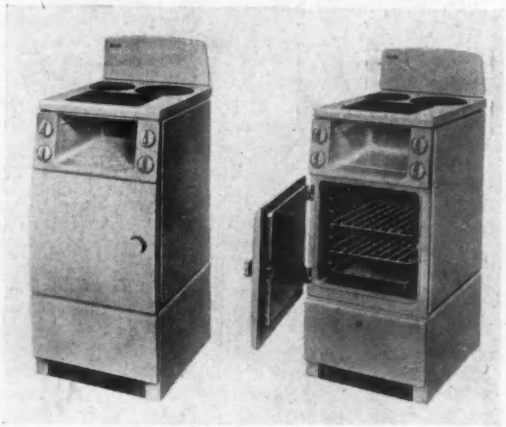
The Creda Star possesses a very large oven—net capacity 2,540 cu in.; two 7 in. cake tins can be accommodated side by side on one shelf; 8 in. and 6¼ in. (6¼ in. 310 only) boiling plates and a grill boiler conforming to E.D.A. interchangeability specification. The oven and 8 in. plate are auto-controlled as standard, and all controls are at waist height. The grill boiler has been specially shaped to retain heat and there is plenty of room for plate warming. Both the grill pan and the large oven meat pan are vitreous enamelled.

The oven of the Creda Star embodies a notable method of insulation—the metal box is wrapped in a blanket of glass fibre wool which is in turn wrapped in aluminium foil. This, say Simplex, ensures faster warming and lower heat losses. The door seal is made of a spiral tube of woven glass which is impervious to grease, cleaning agents and burnt food.

The oven includes the Creda patented system of heat ventilation, tubular sheathed elements, and six position non-tilt shelves. The oven control knob glows when the oven is switched on, when it is in the process of attaining the temperature dialled, and whenever the temperature falls below the dialled heat as a result of normal heat losses in cooking.

Note that the 310 model is available with an extended hob, complete with towel rails at slight extra cost, and that the 305 can easily be converted to a 310.

The hob, splash plate, front frame, grill chamber, oven door and front of plinth, are all finished in Creda acid-resisting porcelain enamel; the oven interior is finished in a light mottled vitreous enamel; side panles and plinth sides or legs are bonderised and high temperature stoved enamelled. Standard finish two tone ivory (plinth models), grey and white (leg models). All other parts are rust-proofed; bright parts are heavily plated. Dimensions are 36 in. high (to hob), 18¼ in. wide. Depth over door handle 23¼ in. Total loading of model 310 with solid elements 7,200 W. Model 305 is, of course, 1 kW lower in rating. Prices are 305 £25. 10s. and model 310 £27. 10s.



The "Star" has most attractive lines plus a capacious oven with non tilt shelves

The "Alderberry"

NEW model added to the range of fires by BERRY'S ELECTRIC LTD., 85 Newman St, W.1, is the Alderberry No. 110 in the firm's list. A handsome model with 2 kW heating basket the Alderberry has an attractive log basket with the new recessed heat reflector and is suitable for fitting over the opening left by a coal grate. The fire is in armour bright finish with satin brass enrichments. Full heat control is provided by moving a stump on one of the logs.

The attractive Alderberry

Dimensions are as follows: Width 19 in., height 24 in. and depth 9 in. The outer cover on the heat reflector (21 in. high by 12¼ in. wide) projects 6 in. from the back of the fire bringing the overall depth to 15 in. Price is £19. 10s. plus 36⅓% p.t. at £7. 2s. 7d.

For the Electrical Trade

"Erres" Vacuum Cleaner

NEWLY appointed sales agents in Britain for the Erres range of vacuum cleaners are G. A. DISTRIBUTORS (WHITEHALL) LTD., 29 Whitehall, S.W.1.

At present they are only importing two of these continental vacuum cleaners, models SZ175 and SZ360. Distribution will be through the retail trade and certain wholesalers.

The SZ175 costing 23 guineas is an attractively styled cylinder model with its outer casing resembling a finless aerial bomb. It has a meta-blue and chromium case with black end plates and footswitch faired in the handle. Accessories supplied include in addition to normal complement of nozzles and brushes a vaporiser with insecticide and a covered hose with rubber agitator sleeve.

The SZ360 is a more orthodox model priced at 19 guineas, finish is as the SZ175 and normal accessories are supplied.

TRADE PUBLICATIONS

LABORATORY EQUIPMENT.—Publication No. G.544 issued by INTERNATIONAL COMBUSTION PRODUCTS LTD, 19 Woburn Place, W.C.1, gives details of their rapid Laboratory Elutriator which supplements sieve testing and will divide any sample of fine powder such as mineral ores, ceramic materials, pulverised fuel, ochres and oxide chemicals into three grades.

CONDENSER EQUIPMENT.—Two of the latest booklets produced by the Metals Division of IMPERIAL CHEMICAL INDUSTRIES LTD. are entitled "Integron Low fin tubing for use in Freon 12 water cooled condensers" and "Integron High fin and low fin tubing.

REFRIGERATION.—The PRESSED STEEL COMPANY LTD., Cowley, Oxford, have issued two new publications Z.218 "Prestcold equipment for the grocer" and Z.201 which deals with the range of Prestcold display cabinets.

DOMESTIC APPLIANCES.—New publications by THE HOTPOINT ELECTRIC APPLIANCE CO., LTD., Fletton, Peterborough, are descriptive lists covering the Clothes Dryer Model ED.58 and the 430 4¼ cu ft table top refrigerator.

PROBLEMS AND PRACTICE

In Engineering

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

Dirty Starter

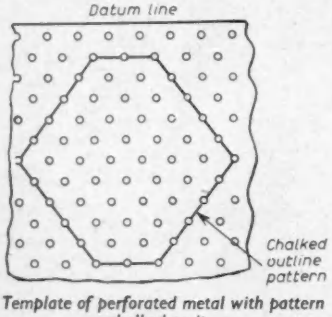
REFERRING to the note under the above heading in the 6 May issue, the point that seems to require the most emphasis was contained in the sentence regarding the inaccessible fuses and the loss of an isolator in the circuit. The number of laws, rules and codes of practice transgressed in this installation, made the following account of the current tracks in the dirty starter the least important point of the experience, except to illustrate the danger of commencing work on any apparatus until it is effectively isolated.

Although no control circuit retaining contacts were shown in the sketch these must have been fitted in the starter, and a current track across this may just as easily occur under such conditions, causing the motor to start without warning, and without the spanner bridging the connections to earth.

No amount of trouble can be too great in order to isolate a circuit before work commences and even then in certain circumstances a further precaution can be taken by short circuiting to earth parts that may inadvertently be switched on. I am sure your correspondent, after this experience, strongly recommended the fitting of an isolator suitably located to conform with Reg. 7 of the Factory Acts Electricity Regulations.—*T. H. Snelson.*

Makeshift Template

I HAD to improve the ventilation of a number of steel-encased components by drilling a series of holes in the cases. It was important not to detract too much from the appearance of these units, so it was decided to drill a number of small holes in a definite formation in each case.



Template of perforated metal with pattern chalked on it

To do this easily and quickly, I obtained an odd piece of perforated metal and sketched thereon, in chalk, the design formation I wanted. By laying this piece of perforated metal to a datum line on each case and drilling through all the holes contained within the chalked outline, I ensured a constancy of pattern and a neat finish in a minimum amount of time. It will be appreciated that many patterns of holes can be made up and drilled without difficulty, using this make-shift template.—*G. G. Clegg.*

Gas Pipe Earthing

THE present discussions on earthing remind me of a problem I encountered some time ago and I have not seen these conditions discussed in any article I have read. I had completed an installation in a large house, which included a number of 15 amp three-pin socket-outlets. These were wired with 7/·029 twin t.r.s. with e.c.c. each on a separate circuit. All e.c.c.'s were soldered into a ferrule at the back of a fuse board together with the main earth conductor of 7/·044 v.i.r. which was then taken a short distance and securely bonded to the rising lead water main approximately 6 ft from ground level. The installation was tested, including earth resistance tests; everything was satisfactory, and then connected.

However, during the time we were still on the premises clearing up, a workman in another part of the house cut through one of the cables feeding a plug. The fuse, of course, immediately blew. Arrangements were put in hand at once to rewire the circuit but on removing the floor board over the fuse box, a smell of burning was apparent. After some minutes of panic, the fire was located under the floor boards at the remote end of the house where no work had been done and no wires were in the vicinity. It was discovered that a gas pipe had burnt through and was now throwing a jet of flame against the beam. It was soon extinguished with no serious damage.

Further investigation revealed that the gas pipe had melted where it crossed an old girder built into the house. The water pipe was found to be resting on the same girder at the other end.

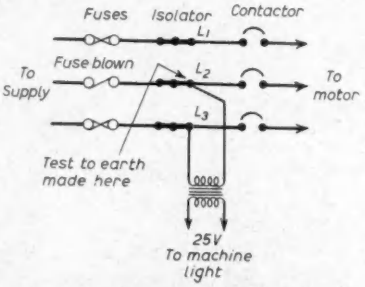
It was apparent that a large part of the leakage current must have found a path along the girder, and burnt a hole in the gas pipe. The point at issue is—what tests can be made to indicate that this condition exists? There must be many premises where the gas pipes are in contact with the water pipes, and the usual tests for earth resistance give the mean results of all paths back to the substation, and does not indicate whether this would be via the gas or water main. A physical examination of the whole gas and water system is almost impossible, and a possible solution is to bond the gas and water pipes so that no spark could jump between them, but, of course, this method is open to discussion, apart from the views of the Gas and Water Boards!

In this particular case, it was fortunate that the fault arose while we were still on the premises, because sooner or later, a faulty appliance in use would have caused an earth fault, with the same unfortunate result, and possibly more serious consequences.

Incidentally, it was afterwards discovered that the gas mains were fed from the same area as the substation, whereas the water main came from a different district not near the substation. This condition must exist in many old buildings, and I should like to know what tests can be applied to indicate this state of affairs.—*W. T. Wedlake.*

Phase Testing

A SERIES of load tests were being made on a motor, and a fault developed. The electrician checked for blown fuses, but he stated that all phases were alive. As the trouble indicated single phasing, enquiries were made as to the method of testing, and, as expected, he had checked with a single lamp, from each phase to earth. The circuit drawing will make it obvious how the feed-back occurred.



Circuit of motor supply showing position of test lamp to give indication

This incident has been used as a general example of the misleading results which can be obtained by testing to earth, this being common as it is very convenient to carry a single lamp and lampholder. A recommended pattern of lamp-box, fused and suitable for up to 500 V should be used, and testing should be between phases as well as between phase and earth.—*P. H. Yeo.*

Electrical Safety in Mines

DURING 1951, there were three fatal accidents in mines as a result of electric shock, and 65 non-fatal electrical accidents in which 71 persons were injured. These are the leading statistics of the Report of Mr J. Cowan, H.M. Principal Inspector of Mines, for the year 1951. The report, signed in October, 1953, has only just been published, and so this summary will concentrate on its general conclusions rather than its descriptions of accidents long past.

The first general point made by Mr Cowan relates to the use of a screwdriver or similar tool to connect the pilot pin to earth in the socket of a gate-end box, apparently in an attempt to close the circuit-breaker when endeavouring to locate a fault. This practice causes many accidents each year, and is directly prohibited by Regulation 131(e). If a fault is suspected to exist on a circuit, then the circuit must be tested and put in good order before power is again applied.

In Mr Cowan's view, there is need for an intrinsically safe testing device for remote control circuits. Such a device should be designed for use only when the isolator of the gate-end switch is in the off position. It is understood that some manufacturers are working on the design of such a device.

Another point of general importance concerns the increasing number of electric shock accidents in which electricians are involved. Investigation of the statistics has shown that increasing use of electricity at the coal face cannot be regarded as the cause of the increase. Over half the accidents are found to be the result of negligence. Failure to isolate gear when working on it remains an all too common cause of accidents. Working on live gear is particularly reprehensible when apprentices are present.

Apprentices figure in another general conclusion as well. It is felt necessary to stress the importance of close supervision care and training; the responsibility for the safety of electrical apprentices must be placed on the electricians who have charge of them, and they should not be permitted to do any work at any time which may involve them in danger.

Accidents occur quite frequently due to the leakage resetting device on some piece of apparatus having been reset by an unauthorised person. It is now well known that a fire seldom results from a damaged live cable on an a.c. system when a phase to earth fault develops, provided the core balance instantaneous e.l. protective device operates at once—and is not reset until the defect has been rectified. Unauthorised interference and repeated resetting of the leakage trip and reclosing of the breaker, however, generally results in an outbreak of fire. In most cases, it is found that repeated resetting of the protective device is only made possible as a result of deliberate damage to the locking device fitted to deter unauthorised interference. The remedy lies in the prevention of such damage and careful maintenance of safety devices.

NEW LITERATURE

Electronic Engineering Principles

by J. D. Ryder, PH.D.

IN its second edition this book incorporates considerable new material as required by the present rapid advances being made in electronic engineering, although its overall size remains little unchanged. Much of the new material is concerned with solid-state devices and transistors, a chapter being given over to these subjects. Elsewhere extensive rewriting has been undertaken, particularly on amplifiers which are now given a more general treatment and the section on feed back has been expanded. Substantially, the organisation of the book has been preserved and it remains as a useful part of the electronic engineering student's bookshelf, despite the American terminology used throughout.

From the start, the book accepts as a fact that electronics has outgrown its original status subordinate to radio and communication engineering. It commences with a useful outline of the fundamental concepts of conduction and atomic structure, rapidly moving forward into a detailed consideration of the motion of charged particles in fields as a preliminary stage to valve operation. This leads to the practical consideration of theory in the operation of cathode-ray tubes, before attention is turned to the mechanics of electron emission, space charge and then vacuum valves themselves. Valve theory and operation is developed in conventional fashion from diodes and diode rectifiers to triodes and then multi-electrode valves and their practical application in large-signal amplifiers. The mechanisms of gaseous conduction is then fully described, giving practical considerations in a section dealing with control valves and circuits. To close the book come usefully detailed chapters on photoelectric cells and transistors. Second edition, published by Pitman, 505 pages, 8¼ in. by 5¼ in. Price 37s. 6d.

Principles of Electricity in M.K.S. Units

by A. Morley, O.B.E., D.SC., HON.M.I.MECH.E., *and E. Hughes,* D.SC.(ENG.), PH.D., M.I.E.E.

APART from the novelty of the M.K.S. system being used as its basis, this useful book collects, in one cover, all the material required by students studying electrical engineering in the first two years of the Ordinary National Certificate. Because, however, it is one of the first basic textbooks to employ the M.K.S. system, there is a temptation to deal with it as a speciality, but it is as a standard textbook that it must be judged. As such, its clear, concise explanation and approach to the subject rate its status at least the equal of other books for these courses. Beginners should find no difficulty in grasping the essentials of the M.K.S. system laid out in the first chapter and then following the argument as it is developed right through to the end.

Being intended for the first two years of the O.N.C. course, its organisation is conventional. From the opening chapter on units, the student is introduced to the electric current and from that to various simple forms of circuit which culminate in elementary applications of Kirchhoff's laws. Electromagnetism is then considered, followed up by induction, the magnetic circuit and inductance. After a single chapter on electrostatics, alternating voltages and currents are introduced. Subsequent chapters dealing with various aspects of a.c. circuitry. This then leaves the stage clear for d.c. machines which are discussed firstly by considering armature windings and the e.m.f. equation before dividing into generators and motors. Concluding chapters deal with measurements and secondary cells. Worked examples and problems are scattered liberally throughout and there are the usual mathematical tables, conversion tables at the end. Published by Longmans, Green and Co., 364 pages, 7¼ in. by 4¾ in. Price 10s. 6d.

BOOKS RECEIVED

Meter Engineering, by J. L. Ferns. New edition to bring general information up to date. Sixth edition, published by Pitman, 353 pages, 7¼ in. by 4¾ in. Price 27s.

The Insulation of Electrical Equipment, edited by W. Jackson. Compilation of lectures delivered to a post-graduate vacation school at Imperial College, designed primarily for junior engineers. Published by Chapman and Hall, 340 pages, 8½ in. by 5½ in. Price 42s.

Projection Welding of Mild Steel, prepared by the F.R.3 Committee of the B.W.R.A., it deals with all aspects of this subject, information prepared from a series of researches conducted during last five years. Published by the British Welding Research Association, 29 Park Cres., W.1, 14 pages, 8½ in. by 5½ in. Price 3s. 6d.

NEWS OF THE WEEK

Decade of Development in Highlands

BOARD'S GENERAL MANAGER OUTLINES PROGRESS AND PLANS

THE N. of Scotland Hydro-Electric Board's plans for the future were outlined by the general manager, Mr T. Lawrie in an address to Aberdeen Rotary Club last week. In the face of past and future developments, Mr Lawrie said it might well be asked how the Board would fare financially. To date they had paid their way, he said, and despite increases in costs incurred, the price per unit of electricity had risen by only 12% on average since 1949. That moderate increase was due to the economy of water power, exports to Southern Scotland, and increased consumption. It was due also to the Board's strenuous efforts to be economical and to increased efficiency. These latter items were exemplified by the fact that the Board had not taken on any additional staff since 1949 although 88,000 new consumers had been connected, hydro-electric production had risen 200% and 12 new power stations had been commissioned.

The Rotary Club was told that to meet the increasing demand for electricity and to save coal, the construction of further hydro-electric stations was being proceeded with and by 1959 it was hoped to add 420,000 kW of plant. Total in operation at the end of this decade should be about 819,000 kW of plant, Mr Lawrie said. After that had been achieved, three-quarters of the Highlands potential water power would still remain undeveloped.

On rural electrification, Mr Lawrie said the Board had completed well over one-third of its task. The 25,000 farms still unconnected were the most isolated premises. A very few might not have a supply in the present owner's lifetime, but a number of comprehensive local schemes were being embarked upon, and the back of the job should have been broken within ten years. Steady progress was being made in Aberdeenshire, a start would be made soon in Banffshire, and the first pole would be erected in Kincardineshire in the next few months.

Work begins on Elstree-Staythorpe Grid Line

TOWER construction began recently on the 114-mile section of the Super-Grid between Staythorpe and Elstree. The contract, which is being carried out by British Insulated Callender's Construction Co. Ltd., involves the erection of 560 towers and the stringing of twin SCA conductors on each phase of this double circuit line. The conductors have a cross sectional area of 0·4 sq in. copper equivalent, and are being used to allow for the possibility of 380 kV transmission in the future. For the same reason, the towers are designed for either 275 kV or 380 kV transmission, provision having been made for an increase in the number of discs on each insulator string. This line will eventually connect with the Tilbury-Elstree section to form another link in the Super-Grid network.

NEW PAY RATES FOR CABLE INDUSTRY

A REVISION of the wages structure and adjustments to the basic timeworking rates in the electrical cable making industry, to operate from the third pay day in June, was agreed at last week's meeting of the J.I.C. The adult timeworkers rates are increased by ½d. an hour, those for youths of 15-17, ½d. and 18-20, ½d. and for girls 15-17, ½d. an hour. The differential between the six classifications of adult male employees and the differential between the three classifications of adult female employees are both to be raised by 1d. an hour.

New Age in History of Electric Railways

AS from 14 June every train running between Manchester and Penistone will be drawn by an electric locomotive. This new era in passenger and freight transport will be facilitated by the opening of the new Woodhead tunnel today (Thursday). The ceremony is being performed by Mr Lennox-Boyd, the Minister of Transport. The Woodhead tunnel is one of the main features of the new Manchester-Sheffield electric railway. Begun in 1949, it is three miles long and runs beneath the Pennines from Woodhead to Dunford Bridge.

NOTABLE ELECTRICAL CONTRACTS SECURED

1. For British Railways

ORDERS for 170 sets of equipment for 350 h.p. diesel-electric shunting locomotives for British Railways have been placed with the English Electric Co. Ltd. This is part of the programme announced towards the end of 1951 to provide a total of 573 diesel shunting engines during the five years up to 1957. The first 78 sets of the newly ordered equipment are to be delivered next year and the remaining 92 in 1956.

2. For Colombia

IT WAS announced by W. T. Henley's Telegraph Works Co. Ltd. last Monday that they have just secured a $1 million contract for the supply of telecommunication cables to the Telephone Co. of Bogota. The cables are required for the expansion of the Colombian Telephone system. The order was obtained in competition with ten other British and foreign tenderers, and it follows a number of dollar cable orders obtained by Henley's from the city of Seattle and other American concerns.

3. For Pakistan

WE hear that Wandleside Cable Works Ltd. have secured orders valued at £100,000 from the Government of Pakistan. The contracts should be completed by the middle of next year.

E.R.A. Explains Its Research on Fuses

THE SERIES of meetings, suggested some time ago now, aimed at explaining more fully the work of the Electrical Research Association, moved off to a most satisfactory start last week. It will be recalled that in the Association's last annual report it was stated that informal meetings would be arranged at which progress in particular aspects of research would be explained by the technical staff. They would amplify the information given in relevant reports, and, of course, the opportunity would be provided for questions.

The first of these meetings took place on 26 May when the subject discussed was fuses. Almost 40 attended and heard Mr Baxter briefly review the last ten reports. There was a lively discussion afterwards, and it was generally agreed that the meeting was most useful, both in making the Association's work better known and in discovering the needs and problems of industry.

Strike Extension Rejected

A PROPOSAL to call on the Executive Council of the Electrical Trades Union to extend the strike of maintenance electricians at the Greenford and Cadby Hall factories of J. Lyons and Co., to the other factories in that group, was rejected by 261 votes to 19 at a meeting of the electricians on Monday last it is reported.

Protect Public against Dangerous Appliances

THE VIEW that there should be in this country some form of safety standards and an identifying mark to show that domestic equipment has attained that degree of reliability, is growing among domestic appliance manufacturers. This opinion is by no means new but the matter was discussed repeatedly during and after this year's B.I.F. Mr John Wade, managing director of Dimplex Ltd., one of the strongest advocates of this form of protection for the domestic consumer, told the ELECTRICAL TIMES last week that he was most concerned at the present situation which allowed anyone with the necessary components to put cheap and shoddy appliances on the market. The buyer with little electrical knowledge was completely at the mercy of the manufacturer and might easily be the victim of dangerous apparatus. He particularly emphasised the fact that to sell appliances abroad, the exporter had first to obtain the approval of that country's standards organisation, often at very considerable expense, whereas in England where the E.D.A. testing house was available free of charge, there were no such safeguards. Mr Wade is by no means alone with his opinion, and we understand he has plenty of support, particularly among Midland manufacturers. He would not commit himself to saying that he personally would be taking any active steps at the moment to try and implement his views, but he is strongly in favour of something being done to rid the country of all unsafe electrical fittings.

Radio and Television Sales during March

THE pattern of radio and television sales in March continued as in previous months. Both declined again slightly according to the latest figures issued by the R.T.R.A. last week. Now that the summer is here and the usual seasonal decline may be expected it seems as though 1954 sales will fall well below the record results achieved last year with the aid of coronation festivities. Radio sales are still well above those of the corresponding month last year, but TV sales are down. The average number of sets sold per shop during March were:

Month	1954	1953
Radio:		
February ...	8·92	5·64
March	8·56	5·3
Television:		
February ...	6·55	8·1
March	5·42	8·31

British Exhibits at Sacramento Fair

MANUFACTURERS of electrical equipment and appliances who have been successful in gaining a foothold in the American market will no doubt be interested in the State Fair to be held at Sacramento from 2 to 12 Sept. Once again there is to be an official U.K. stand where consumer goods imported from Britain on sale in the local shops at the time will be displayed. Last year's event attracted 767,253 visitors, and there were ten foreign nations participating. Those directly interested should write to the British Consulate General, San Francisco 4, California. Others, wanting more information, are advised to contact the Exhibitions and Fairs Branch of the B.o.T. at Lacon House, Theobalds Rd, W.C.1.

Aberdeen's Tramcars may be Abolished

WHILE controversy rages in London over the proposed scrapping of trolleybuses, the future of Aberdeen's trams hangs in the balance. The transport general manager was asked last Thursday to report on the abolition by stages of the city's tram services and their replacement by bus services. At present the city is faced with an estimate of £177,000 for tram track repair and replacement if the trams are to be continued on the existing scale. The report is expected to come up for consideration next September.

Special crane trailer supplied to the Mexican Power and Light Co. by Cranes (Dereham) Ltd., will greatly accelerate the erection of overhead lines in Mexico

Cable Slinging in Triplicate in Mexico

TO SAVE time and labour in the stringing of overhead electricity transmission lines, the Mexican Light and Power Co. have acquired a special trailer which pays out three cables simultaneously as it is drawn forward. Built by Cranes (Dereham), the trailer is a six-wheeler employing a cross-country suspension of a type developed during the war for tank recovery work. It will carry a maximum load of 10 tons.

The main deck of the trailer is flat, but is sloped down at the rear where two hinged ramps are provided. Cable drums can be hoisted up the ramp and on to the deck by means of a hand-operated winch mounted at the forward end above the front axle. To carry the drums three shafts are spaced equally along the length of the deck and are carried in arms pivoted in the top of A frames on the sides. The ends of the drums are supported by screw jacks so that the drums can be raised clear of the deck. Rotation of the shaft carrying each drum is controlled by means of an internally expanding brake. The brake drums are geared to the shafts and are controlled by levers grouped at the front end of the trailer. A second operator controls three cable guides which are mounted in a superstructure at the rear.

OFFICIAL PUBLICATIONS

DEFENCE SPECIFICATIONS, DEF-20: Binding and Identification Sleeves for Use on Electric Cables and Equipment Wires. H.M.S.O. 1s. 6d.

OVERSEAS ECONOMIC SURVEY. Costa Rica. H.M.S.O. 1s. 6d.

MARKETS IN MIDDLE EAST. Report of U.K. Trade Mission to Iraq, Kuwait, the Lebanon, Syria and Saudi Arabia. (see page 819.) H.M.S.O. 5s.

Sheffield to be told How to improve Power Factor

FOLLOWING the decision of the Yorkshire Electricity Board to introduce their new industrial tariff on 1 Oct., an exhibition is to be arranged in Sheffield this month to show industrialists how to save money. We understand it is being organised by the Board's Sheffield sub-area and will take place at the City Hall. Those affected by the new tariffs will be shown how they can improve the power factor of their supply. About ten manufacturers are being invited to exhibit and there will be lectures and demonstrations. Letters of invitation have already been sent to local industrialists.

Philips' new demonstration van should attract a deal of attention as it tours the country publicising Philishaves. One might have to go a long way to find better accommodation than that included in the van for the travelling salesman

New Mobile Showroom goes on Summer Tour

DESIGNED and built by a London Carriers team the new "Philishave" mobile showroom takes the road next week calling at Chatteris, Cambridge, first stop on a summer tour of Britain. An articulated unit comprising a Bedford Scammell tractor with a Tasker drop frame 22 ft trailer, the demonstration van will tour Britain calling at all the principal county shows and will afford free trial facilities for the Philishave Bi-ax dry shaver.

In blue, mushroom and cream livery the van is so equipped that it can be independent of outside services. An Auto Diesels 1½ kVA portable petrol electric generator provides power where necessary whilst in addition a stock of dry batteries will be carried for unforeseen emergencies. The interior including a tail-board platform is divided into the showroom section and the attendant salesman's quarters. Two 60 W tungsten ballast lamps and two 40 W fluorescent lamps provide main lighting supplemented by two Weymouth Mark II spotlights.

How Effective is a Consultative Council?

THE STATUS of Consultative Councils and their effectiveness is the cause of some concern and deliberation at present on a variety of subjects. Latest indication of this comes from the Midlands Area. At a meeting of the Council in Gloucester recently dissatisfaction was expressed that as the consumers' representatives they were unable to play any part in the fixing of the bulk supply tariff. The Council was able to approach, and make representations to the Board on the subject, but they could not contact the B.E.A. who actually fixed the charges. The Council had previously communicated with the Minister and his reply was to the effect that if a more effective means was found of making the B.E.A. aware of Consultative Councils' views on bulk supply tariffs, it would require legislation to make it operative. A resolution was passed urging that the law should be altered and that a review of the matter take place soon.

This matter of the effectiveness of Consultative Councils has also been in the minds of members of these bodies in S.E. Scotland and in Yorkshire. It will be recalled that the S.E. Scotland Council doubted their ability to approve new electricity tariffs. Were they merely a body which the Board could hide behind, acting as a buffer between the Board and consumers' complaints? it was asked. Just recently also Yorkshire's Consultative Council complained of inadequate knowledge as regards tariffs, and resolved that it be suggested to the Minister that a representative of the Councils be a member of the B.E.A. in the same way as the Council chairmen were members of their respective Boards.

Wildfowl Trust makes Good use of Electricity

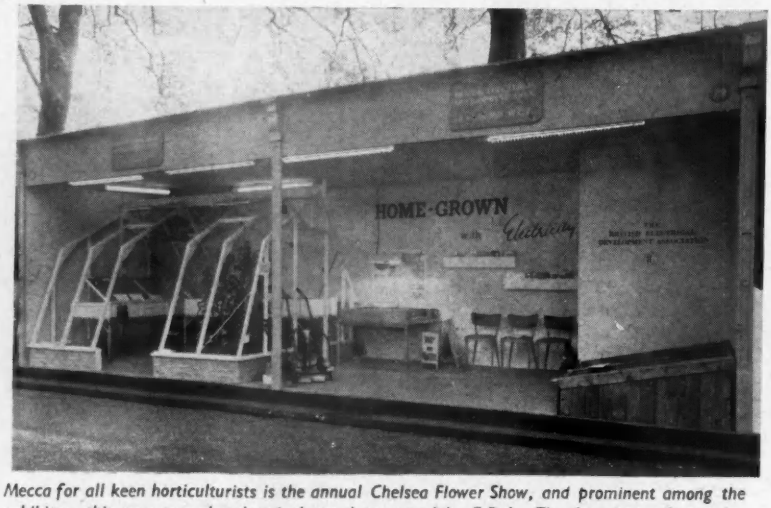
TO keep fresh water flowing during the summer through the streams under its control, the Wildfowl Trust has had a 7½ h.p. electric motor, capable of pumping 20,000 gallons of water an hour, installed at their Skimbridge, Glos., premises. The installation follows the provision of mains supply to Skimbridge last December, as part of the Midlands Electricity Board's rural development programme. The Trust has now a large amount of electrically operated apparatus being used for a variety of purposes, and members of the I.E.E. will be able to inspect the equipment when they visit the Trust during their Summer Meeting.

The First Half-Century

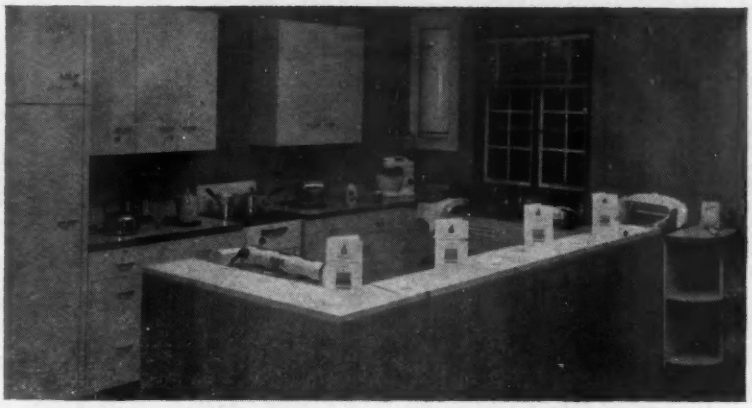
There has lately been a general outbreak of automobilism amongst railway companies in England. There is nothing very novel about the use of automobiles on railways, though it is only recently that they have been introduced in this country. Where they prove most useful is in the operation of more or less unimportant branch lines. Single cars, or possibly motor cars with one or more trailers, can be operated at a cost per train-mile far below what is possible with steam locomotives and ordinary coaches. Results obtained on British railways have been most satisfactory and fully justify the experiment. Unfortunately the electric automobile is at present out of the running. The time may come when an ideal storage battery will be put on the market, but now, the great weight and costly maintenance of accumulators render them unsuitable.—*From our issue of 2 June, 1904.*

Days of Sail

BATTI-WALLAHS and guests were treated to a lively and amusing speech last week when Mr F. G. G. Carr, director of the Maritime Museum at Greenwich, gave some general comments on the Royal Navy and the early days of sail. He was particularly interesting on the subject of the Cutty Sark, now preserved for posterity.



Mecca for all keen horticulturists is the annual Chelsea Flower Show, and prominent among the exhibitors this year was the electrical stand sponsored by E.D.A. The Association featured a reproduction of the amateur gardener's greenhouse frequently mentioned in the B.B.C.'s popular Sunday afternoon gardening programme "Home Grown"



Contracting Scholarships for 1954 Awarded

TWO 19-year-old apprentices have been awarded scholarships for 1954 by the Apprenticeship and Training Council for the Electrical Contracting Industry. The two successful candidates are Mr A. W. J. Venn, a Somerset man and a student at Bristol College of Technology and now employed by Colston Electric Co., Ltd., of Bristol, and Mr B. Lott of Burnley who is a student at Burnley Municipal College and employed by Meeder's Electrical Services. The scholarships are tenable for three years and enable the winners to take degree courses at a University or Higher National Diploma Courses at a Technical College. They cover fees, examination expenses and maintenance allowances. This is the second year in which higher educational scholarships have been awarded by this Council.

No Mains Supply for 1954 Essex Show

ON another page there is an account of the generating plant installed on the site of the Bath and West Agricultural Show to meet the electrical requirements of exhibitors. The procurement of that private equipment arose from the organisers' initial difficulty in obtaining favourable terms from the Electricity Board for a mains supply, and, although probably on a smaller scale, much the same problem has arisen in recent weeks at the Essex Show, to be held this year at Colchester. As a result there will be no mains supply for the Essex Show this year. The organisers were unable to meet the charge imposed by the Eastern Board and exhibitors requiring power will be providing their own. In the past all heating for catering had been carried out with Calor gas and coal fires, and mains electricity had been provided by the Board. It is understood that to supply the Colchester site, the Board would have to erect nearly half-a-mile of o.h. lines. The Board treats all agricultural societies alike and invariably asks for a proportion of the cost. They state that all other societies had accepted their terms, but the Essex Show had not.

Independent Advice on Electrical Appliances

A short time ago we reported the inauguration of a new idea for small independent service centres in large stores where customers could obtain free and unbiased advice on any aspect of running a home from trained domestic economists. The idea belonged to Miss Joan Storey, and we heard last week that the Joan Storey Home Service Centres, as her enterprise is called, opened its third bureau at the House of Toomer, the Newbury store specialising in radio and electrical appliances. Our accompanying illustration shows the new Home Service Centre and the electrical kitchen which has been installed

MODEL ENGINEERING

THIS year's Model Engineer Exhibition, to be held at the New Horticultural Hall, Westminster, from 18 to 28 August, will be opened by H.R.H. Prince Bernhard of Holland, who is flying over specially for the ceremony. Two new cups are to be awarded. The first, commemorating the opening of the exhibition by H.R.H. the Duke of Edinburgh in 1952, will be competed for by previous prizewinners. The other is the Students Cup, and is aimed at encouraging students to enter exhibits.

Taunton District connects 100,000th Consumer

IN these days of rapid progress with rural electrification, landmarks in development come and go in quick succession. An important mile-post was passed in the Taunton sub-area of the S.W. Electricity Board last week, however, when the sub-area's 100,000th consumer was connected. The notable premises to receive a supply was Newbridge Farm at East Huntspill and to mark the occasion, the owners, Mr and Mrs Case, were presented with an automatic tea maker to add to the already large amount of labour-saving electrical appliances on the farm.

It is interesting to record Mr E. A. Newburn, the sub-area manager's comments on the occasion. He remarked on the fact that Taunton claimed to be the first town in England in which the streets were lit by electricity. It may also have been the pioneer of floodlit football, as history reveals that a football match was played in the park by the light of three arc-lamps about 1880. Experimental demonstrations of electric lighting in Taunton dated from 1879.

BON VIVEUR AT TORQUAY

THE Ideal Restaurant of the Future was the subject of a demonstration to the catering trade arranged recently by the S.W. Electricity Board and the Torquay Hotels Association. Ideas on the subject came from Phyllis and John Craddock, the food and wine connoisseurs, familiarly known as Bon Viveur. For the occasion, the ballroom at the Imperial Hotel became a restaurant and Bon Viveur suggested their ideal restaurant should be equipped with electric cookers with fan extractors to remove the cooking smells, electric hand mixers and a refrigerator. Maj. Craddock explained that the refrigerator would be used mainly for wines to dispense with the useless ice bucket.

NEWS IN BRIEF

About 60 exhibitors will be showing the latest machines, equipment and power tools available to the building trade at this year's Building Plant Exhibition. Organised by the Ministry of Works, the 1954 Show will take place at Hills Meadow, Reading, from 24 to 30 June.

Five-day residential course on Staff Management in Offices is being organised at Coburg Court Hotel, W.2, by Institute of Personnel Management.

In a medal competition over the Edgbaston course on 26 May, V. J. Hadley won the Midlands Radio Industry Golfing Society's Captain's Prize with a round of 80 (64 net). Runner-up was Clive Nichols with 72 (69 net). H. Ball won the visitors' sweep with 85 (61 net).

Official opening of Kent Bros. Electric Wire Co. and E. H. Phillips Ltd.'s new factory at Bracknell, Berkshire, takes place this afternoon (Thursday).

We were pleased to receive a brochure from the Glass Manufacturers' Federation, commemorating the opening of the Glass Industry's new premises in Portland Place, London, W.1, describing the building and the facilities afforded.

Technical Journal of the Brush Group has been awarded a certificate of merit by the International Council of Industrial Editors. There were 955 entries from all parts of the world for the competition sponsored by the Industrial Editors' Association of Chicago.

Twenty-fifth National Cost Conference of the Institute of Cost and Works Accountants was held at Southport last weekend.

A party of 127 people sailed on 22 May aboard the *Arcadia* at the start of Philips Electrical's Mediterranean cruise. All are winners in the company's competition requiring dealers to make exemplary efforts to sell radio sets.

QUESTIONS IN PARLIAMENT

Policy Co-ordination

A STATEMENT on the arrangements being made for co-ordination of the broad policy of the fuel and power industries was called for last week by Mr A. Palmer. He was told that the Minister had approved the investment and research programmes of each nationalised industry, and for more general purposes he had the advice of a co-ordinating committee comprising the heads of the three industries concerned. This arrangement, Mr L. W. Joynson-Hicks asserted, fully implemented the recommendations of the Ridley Committee.

Coal Prices

A COMMITTEE to investigate the price structure of coal with a view to readjusting the scale of prices so as to bring money value into closer relationship with the efficiency value of coal, has been suggested by Mr P. Roberts. The Parliamentary Secretary to the Fuel Ministry said the proposal had been considered but had not been thought necessary. The Coal Board had already endeavoured to secure a close relationship between quality and price although there were other factors also. Mr Roberts maintained that the basis of fixing coal prices was not known, and when told that the Consumers' Council considered prices before they were implemented, he said that still did not mean that a proper basis for calculation had been made known.

Superannuation

WAS it proposed to agree with the B.E.A.'s request that a superannuation scheme applying to all grades should be instituted as soon as possible? Mr J. Rodgers asked last week. Mr L. W. Joynson-Hicks said a scheme applying to all staff grades was already in operation. For manual workers, arrangements which existed before nationalisation applied to the majority and proposals for extending them to cover all such workers was under consideration.

B.E.A.'s Title

REPLYING to Mr A. Palmer last week, Mr L. W. Joynson-Hicks said he did not expect the proposed change of title from British to Central Electricity Authority would involve any substantial expenditure.

Capital Investment

ALTHOUGH the question related to a subject other than fuel and power, Mr B. Janner asked last week for an estimate of the amount of capital expenditure on coal production, the production and distribution of gas and electricity, and on roads. Mr R. A. Butler said that between 1948 and 1952, capital expenditure on coalmining was £152 millions, on gas it was £177 millions, and on electricity £676 millions. The figures included replacement of assets. The figure for roads was £43 millions to which should be added the greater part of the £250 millions spent on road maintenance. Mr Janner was asking if more could be spent on roads in view of the fact that £900 millions had been borrowed by the Gas Council, B.E.A., and Transport Commission.

East-West Trade

THE President of the Board of Trade told the House last week that Britain, and other countries maintaining security controls on East-West trade, had made considerable progress in reviewing existing control lists. Agreement had been reached on a number of changes, but not all countries had been persuaded concerning the wisdom of removing particular items from the prohibited list in advance of others. Discussions were continuing and the policy of relaxing controls as much as possible still existed.

Demolition of Houses

LAST week we reported the concern felt in Bristol about the installation of new electricity meters in houses about to be demolished. In the House, Mr S. S. Awbery suggested that the Minister of Housing should circularise local authorities advising them to inform Electricity Boards about houses due to be demolished. Mr A. E. Marples said he was grateful for the suggestion and it would be considered.

Trolleybuses Again

PROPOSED conversion of London's trolleybuses to diesel operation has created some controversy and each week we are reporting references to the subject in the House. Last week was no exception and attention was drawn mainly to the aspects concerning importation of fuel and pollution. Mr. F. Beswick considered it would have been wiser to avoid having to import fuel for this purpose and asked that the relevant data be made available. The Minister of Transport said he was satisfied the matter had been considered exhaustively and that the new proposals would greatly assist in speeding up the flow of traffic.

Greater pollution by the use of more diesel oil was raised by Mr L. W. Teeling, who asked that the L.T.E.'s decision be deferred until the Medical Research Council had made their report. The Minister replied that he would not interfere with the decision except as a matter of national importance. Earlier Mr E. Davies had asked if there was any more pollution from diesel oil engines than there was from the consumption of coal in power stations generating electricity for trolleybuses. The Minister said the amount of benzypyrene generated through diesel oil exhausts was no greater than from petrol exhausts and might well be considerably less. Mr Teeling gave notice that he would raise the matter again on the Adjournment. This follows Mr G. Nabarro's announcement last week that he would do the same.

Tax Assessment

ESTIMATED cost to the Inland Revenue of assessing the nationalised industries to Income Tax, Profits Tax, and Excess Profits Levy was about £10,000, Sir W. Wakefield was told in a written answer last Thursday. Mr J. Boyd-Carpenter added that the purpose was to implement Parliament's decision that those industries should be subject to the same general system of taxation as other industries.

Trade Liberalisation

WE have now liberalised 82% of our imports on private account from member countries of the Organisation for European Economic Co-operation, Mr. D. Heathcoat Amory told the House last wek. A major relaxation of import restrictions had been undertaken in recent months, he said, and bearing in mind the fact that we were still heavily in debt to the European Paymens Union, the risk of any further substantial liberalisation could not be taken at present. Replying to another question, Mr. Amory said about half our imports from Canada and the U.S.A. were free from import licensing restrictions.

Fuel Saving

SOME figures on the extent of Government loans for the fuel saving scheme operated by the Ministry of Fuel and Power were given by Mr Geoffrey Lloyd last Monday in reply to Capt. Kerby. He said a total of 44 loans had been made, 88 applications had been refused or else had been withdrawn, and the total number of requests for assistance from industrial concerns was 174.

Sayings OF THE WEEK

"I suggest this matter be carried forward in a somewhat more vigorous manner, the aim being to raise station superintending engineers to at least the same level of say, public relations officers and similar officials" . . . Ad/5799 in a letter in the *Electrical Power Engineer* on the Association's status raising claim.

"What was the good of being able to hear by wireless what a man in Australia was saying if what he said was not worth hearing?" . . . MR ST. JOHN ERVINE speaking at the E.A.W. Conference.

"Those in touch with research will know that never has there been so many new inventions and possibilities just over the horizon" . . . SIR WALTER PUCKEY, President, Institution of Production Engineers, speaking at the Scottish Design Congress.

COMPANY ACTIVITIES

SHOCK of the week was the sharp fall in Siemens' trading profits from £1,725,000 to £769,000. But once again the tax cushion came in handy and the net profit of £390,000 was only £166,000 lower, before taking into account an E.P.L. refund of £98,500. Dividend is maintained at 10% out of earnings of just over 16½%. Shareholders have had some warning, for the chairman, General Sir William Morgan, told stockholders at the last annual meeting that there had been a slackening of orders, particularly for telephone exchange equipment, from Government departments here and overseas. Now that the Government at home is encouraging capital equipment probably Sir William will be able to inform shareholders at the next meeting that the slack has been taken up.

Competition on the Continent has been another factor, although latest information from Germany suggests that some fingers have been burned by extended credit facilities and cut prices to customers who do not always pay up.

Nothing seems to stop the Plessey Company. Following their 100% bonus recently there is to be an interim dividend of 10% for year ending June 30 next. On the old capital for 1952/53 dividend was 30% including a 12½% interim. On last year's basis the present interim is equal to 20% and forecasts at least the equivalent of 40%, if not 50% on the capital before the bonus already noted.

With the successful sale of its holding in its subsidiary B.V.C. Industrial Constructions, the British Vacuum Cleaner and Engineering Co. will be able to concentrate more finance and technique on what is really the company's main business namely, vacuum cleaning apparatus, washing machines, clocks, etc.

Following last year's loss of over £80,000 (although dividend was maintained at 25%) there has been a substantial improvement in the first half of the current financial year. Vacuum cleaner sales were more than twice in number and washing machine sales have also taken a big move forward. Let us hope that the financial results for the year to September next will show a corresponding improvement.

Another record year has been enjoyed by Mr H. V. Slade, the chairman of Garrard Engineering and Manufacturing Co. Profit expanded from £52,377 to £105,854. Dividend goes up from 21% to 25%. It is covered 4½ times although payable on a larger capital. Neither is this likely to be the peak of the company's activities, and no doubt shareholders are awaiting with interest further news about the factory extension which was started last year, when Mr Slade said that additional floor space was absolutely essential to cope with expanding business.

—From our City Correspondent.

Barton and Sons Ltd.

This conduit tube and fittings manufacturer reports a slightly lower profit for 1953, but the total distribution is maintained at 15% with a final dividend of 10%. Mr A. H. Redfern, the chairman, states that output for the year is comparable with last year, but keen competition is being encountered, particularly in export markets. The subsidiary and associated companies in South Africa and Canada also produced satisfactory results. Since the beginning of 1954 a controlling interest has been acquired in the Canadian company. The directors propose to increase the authorised capital from £1,150,000 to £1,500,000 by the creation of 1,400,000 Ordinary 5s. shares. There is no present intention of issuing any part of this additional capital, however.

Year to 31 Dec.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	372,066	115,209	47	10	6/6	4/7
1950	494,314	161,278	66	12½	8/–	5/3
1951	772,813	292,742	133	15	11/5	7/4
1952	695,888	223,350	77	15*	9/11	7/10
1953	614,856	214,947	56	15	11/7	9/5

*Plus 25% capital bonus.

Calcutta Electric Supply Corpn. Ltd.

The gross revenue for 1953 at £4,996,114 is £222,553 higher than for the previous year, according to the preliminary statement. The final dividend of 3% tax free again makes a total of 6% tax free for the year.

Enfield Cables Ltd.

The full accounts for the year ended 31 Dec. last, indicate that but for the £238,985 trading loss incurred by Brynmawr Rubber and the £68,773 spent on the wind power project, there would have been a profit of over £400,000 for Enfield Cables. Instead the profit is £101,286 compared with £473,024 for the previous year. The Brynmawr Rubber business is being sold to Dunlop Rubber Co. for £750,000 cash. The 100 kW wind generator developed for the B.E.A. at substantially higher costs than at first expected is now completed, Sir Philip Warter, the chairman, reports, and there should be no further liabilities in respect of that project. The machine is not to be manufactured by the company. The aim, when the first machine is working properly in Wales, is to find another enterprise willing and able to carry on and develop what the company has started, he adds. On the present position, he stated that the Rubber and Plastics Departments of the cable works are busy, but the other departments need work. The overhaul and modernisation of much of the heavy plant has continued, and factory layout improved.

Gibbs and Dandy

This firm of electrical wholesalers, builders' merchants, etc., is paying a 20% Ordinary dividend for 1953. This is the rate anticipated when the shares were introduced last July. Net profit for the year is £49,697, subject only to taxation of £25,628, compared with £51,665 subject to £28,256 tax for the previous year.

Harland Engineering Co. Ltd.

Total orders in hand at the end of December last amounted to approximately £2,650,000, a slight reduction on those of a year ago, but sufficient to keep the works fully employed for nearly two years, Mr H. Cowan-Douglas, the chairman, reports. The Water Turbine Department has substantial orders on hand for both turbines and generators. The new fabrication shop and an extension of the drawing office are now in use, and the construction of a new modern pattern shop has been authorised. The Indian associate company again made a small loss, but interests in Canada and Australia had a successful year. Discussions have taken place regarding further developments in the way of manufacture in South Africa.

Year to 31 Dec.	£ Trading Profit	£ Net Profit*	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	115,102	36,142	25	7	7/7	4/10
1950	337,851	70,640	41	9	6/1	4/9
1951	203,822	65,955	38	10	9/–	6/–
1952	206,013	59,672	39	10	7/9	5/7
1953	217,231	66,852	38	11	8/1	6/8

*Available for the parent company.

Paterson Engineering Co. Ltd.

There is a dividend of 15% for the eight months ending 31 Dec. last. This is the same as for the previous year, but actually equivalent to 22½% for a year. The group net profit for the period is £53,602 (*£70,283 for the year 1952*).

Scottish Cables Ltd.

The directors recommend a final dividend on the Ordinary capital of 20%, which absorbs £64,167. This makes a total of 27½% for the eleven months' period ended 31 Mar. last, calculated on a full yearly basis, compared with 20% for the previous full year. The trading profit for the period is £341,539 which is £124,323 less than the figure for the previous twelve months.

Siemens Brothers and Co. Ltd.

Although the group profit for 1953 is down to £867,860 compared with £1,520,649 for the previous year, the dividend is maintained at 10%. After taxation, etc., the group net profit for 1953 is £488,357 (*£556,425*).

Southern Areas Electric Corpn. Ltd.

Judging from the results of the past year, this concern has made a complete recovery from the earlier setbacks after its former electricity undertakings were nationalised. Now there are ten subsidiary companies manufacturing a very

Year to 31 Dec.	£ Trading Profit	£ Net Profit*	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	31,553	—26,978†	—	5¼	21/-	12/9
1950	64,434	— 5,995†	—	—	17/6	7/6
1951	144,432	34,167	8	5	10/9	6/6
1952	255,572	82,460	19	6	12/-	6/-
1953	275,386	92,157	18	7½	19/7	10/3

* Available for the parent company.
† Loss.

wide range of products. The full accounts for 1953 show current assets listed at £996,545, of which stock and work in progress account for £638,242, while current liabilities total £606,545.

Superheater Co. Ltd.

There were considerable increases in turnover and trading profit for 1953, which to some extent were due to freedom from steel shortages, Sir Alexander L. McColl, the chairman, has pointed out. The policy of ploughing back profits in the past for capital commitments has been fully justified, and it is proposed to continue that policy, he adds. The very satisfactory results of the past few

Year to 31 Dec.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	403,229	167,178	158	39*	38/3	33/4
1950	430,808	181,992	120	32½†	36/6	33/9
1951	423,565	166,480	115	32½	29/3	26/7
1952	460,521	183,893	105	35‡	25/6	24/3
1953	568,988	224,956	129	40§	28/6	21/6

*Plus 33⅓% capital bonus. ‡Plus 16⅔% capital bonus.
†Plus 50% capital bonus. §Plus 50% capital bonus.

years are indicated by our accompanying table. At last week's extraordinary general meeting approval was given to the proposal to distribute one Ordinary share for every two held and one "A" Ordinary for every two held. This distribution is effected by capitalising £154,350 from general reserve.

Veritys Ltd.

There is on hand a satisfactory order book and production was maintained for the first three months of the present year, Mr H. B. T. Wilde, the chairman, stated

Year to 31 Dec.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	21,042	4,126	4	2½	4/9	2/7
1950	—10,355*	—18,315*	—	—	3/9	2/10
1951	36,180	17,586	19	7½	4/4	2/9
1952	65,743	14,722	15	10	5/1	3/1
1953	70,461	16,984	18	12½	5/4	4/1

*Loss.

at last week's meeting. There was an improved demand during the latter part of last year, and notwithstanding the continued competition, there had been a slight improvement in the trading profit, as our table shows.

B. S. and W. Whiteley Ltd.

The dividend for the year ended 31 Mar. last is raised by 5% to 35% (*30%*). The group net profit, after taxation, is £102,494 (*£86,788*).

Dividends Declared

Peter Brotherhood. Interim 8% (*5%*).

Crompton Parkinson. Interim of 5% (*same*).

S. Smith & Sons (England). Interim of 5% (2½%) on increased capital.

Electric Supply News

Lake District

The urgent need for a statement of national policy on electricity distribution is emphasised in the annual report of the Lake District Planning Board. The Board points out that if the Vale of Rydal and of Grasmere were kept free of overhead lines by—and at the cost of—a small private company before 1948, surely the nationalised industry could do at least as well for the noble landscape of Borrowdale and of Langdale and for other dales still without a power supply. It is stated that the North Western Electricity Board planned to construct 243 miles of h.t. mains in the National Parks within the next 15-20 years.

At a meeting of the N.E. Lakeland Committee of the Electricity Consultative Council it was stated that 147 electrification schemes involving a capital expenditure of £1,642,000 had been submitted for approval to the Board's h.q. by the Lakeland officials. Involved in the proposed schemes are 2,446 farms and 2,627 other premises. Average expenditure on this class of work had been running at about £75,000 a year, but would have to be materially increased, the Committee were told. Mr J. E. Shepherd, manager of No. 6 sub-area, said he had asked for a capital sum of £750,000 to be spent at the rate of £150,000 a year for the next five years. If this were approved it might be necessary to obtain outside assistance in tackling the programme.

Lincolnshire

A large area of North-East Lincolnshire suffered a complete breakdown in electricity supplies recently because of the inquisitiveness of an agile cat. The feline entered a substation of the Yorkshire Electricity Board at Grimsby and tried to cross the terminals of an outdoor transformer. There followed a blinding flash, seen as far as Laceby in the west and North Elkington in the south, and many villages were without power. Supply was restored by the engineers in about half an hour. The cat was badly burned and had to be destroyed.

Merseyside

The Merseyside and North Wales Electricity Board proposed to spend more than £4 millions to take electricity to a further 7,000 farms, and at least 15,000 houses in the rural areas, Mr D. H. Kendon, chairman of the Board, told the Area Consultative Council last Thursday. The Board connected 1,426 additional farms during the year ended 31 Mar., 1954. He also referred to a concession designed to help medium-sized seaside boarding houses, which is being introduced. This would benefit boarding houses using between 1,000 and 5,000 units or more per annum. Boarding houses with 10 to 20 rooms would be charged at the combined premises tariff, of 4½d. p.u. for the first 100 units, plus 12 units at 4½d. per room p.q. with the exception of two ground floor public rooms. Extra units would be at 1d.

Northern Ireland

Reductions in charges, estimated to amount to £33,610 for the present year, are announced by the Electricity Board for Northern Ireland. The guarantee to use electricity up to an amount representing 17% of the capital involved in giving supplies is to be reduced to 16%. All simple hire agreements in existence at 31 Dec., 1939, are to be terminated as from the billing period commencing from mid-May this year, and the hired appliances or wiring installations will become the property of the hirer without further payment. The coal clause charge is being reduced from 0·011d. to 0·01d. p.u. in respect of every shilling by which the coal at power stations exceeds 65s. per ton. Among the items the Board will be relinquishing are 18,129 wiring installations, 10,000 irons, 6,000 cookers, 5,450 kettles, 4,889 fires, 2,900 water heaters, 1,000 wash boilers and 1,000 breakfast cookers. During the war the Board ceased hiring equipment, but after 1945 agreed to install electrical equipment in houses for the Housing Trust and certain authorities. These agreements are not affected.

Thorington

An 11 kV overhead line cable fell on to a chicken run at Poplar Chase Farm, Thorington, Essex, recently. The system is earthed through Petersen coils, apparently, and apart from some wire netting being melted away no other damage was done. Supply was quickly restored.

Lighting Schemes

Birkdale. It is proposed to spend £2,800 on lighting class "B" roads.

Deal. T.C. has approved a scheme for the conversion of 142 street lamps in the borough from gas to electricity, at an estimated cost of £5,970.

Ramsgate. The T.C. is awaiting Ministerial consent to the conversion of street lighting in Station Approach Rd, Dumpton Park Drive and Montefiore Ave, at a cost of £3,340.

Richmond (Surrey). The Highways Committee are recommending that all gas lights in the side streets be converted to electricity at an estimated cost of £54,000.

Stamford. The Highways Committee has been authorised to prepare a plan for improved lighting in the town.

Warwick. The Corporation Watch Committee has put forward a scheme to improve street lighting at a cost of £10,000.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

5 June—Birmingham. Supply of electrically driven duplex pumps for Tame and Rea Drainage Board.—See 20 May issue.

5 June—Blackpool T.C. Chassis for tower body; and tower body with power elevation.—Advertised in 27 May issue.

5 June—Dublin T.C. Fluorescent fittings for public lighting dept.—See 20 May issue.

5 June—Inverness. Lamps during year from 1 July for Craig Dunain Hospital. —See 20 May issue.

5 June—Willenhall U.D.C. Electrical installation for lighting and power in new boilerhouse at Public Baths to include dismantling of old equipment. Applications by above date to Engineer and Surveyor, Town Hall. Deposit £2. 2s..

7 June—Ballymoney (Antrim). Installation at Route Hospital, Ballymoney.—See 27 May issue.

7 June—Belfast. Insulation equipment, and electrician's requisites for Royal Victoria Hospital.—See 27 May issue.

7 June—Wolverhampton T.C. Sodium, mercury and fluorescent street lighting.—Advertised in 13 May issue.

8 June—Holland. Installation in schools at Holbeach St. John's, Pinchbeck East, Wyberton, Weston Hills.—See 20 May issue.

8 June—Ryton-on-Tyne U.D.C. Installation in 218 houses.—See 27 May issue.

8 June—St. Helens T.C. Electrical installation in first phase of erection of Technical College. Interested persons invited to submit names to N. F. Newbury, Director of Education, Education Offices, by above date.—See 20 May issue.

8 June—Sedgley U.D.C. Street lighting equipment for class A lighting along Himley Rd.—See 20 May issue.

9 June—Brighton T.C. Rewiring of Margaret Hardy school in York Place. Borough Engineer and Surveyor, 26-30 King's Rd. Deposit £1. 1s.

9 June—Dundee T.C. Street lighting equipment.—See 27 May issue.

9 June—Maidstone T.C. Rewiring, etc., in 70 houses on Cherry Orchard estate. —See 6 May issue.

10 June—Belfast T.C. Extension to ash handling plant at Power Station West.—Advertised in 6 May issue.

10 June—Cheadle and Gatley U.D.C. Street lighting in Adswood Rd.—See 27 May issue.

10 June—Crosby T.C. Street lighting scheme between South Rd and Mersey Rd.—See 27 May issue.

10 June—Kirkcaldy T.C. Supply and installation of 400 electric cookers and washboilers. Burgh Engineer, Town Hall.

10 June—Portsmouth T.C. Alterations to Dept. of Electrical Engineering at College of Technology. City Architect, Municipal Offices, 1 Western Parade. Deposit £1.

10 June—Preston T.C. Replacement of installation at Harris Library, Art Gallery and Museum.—Advertised in 13 May issue.

11 June—Barking T.C. Supply and erection of 25 400 W mercury vapour lamps on concrete columns on B1367 route, North St. Borough Engineer, Town Hall. —Advertised in this issue.

11 June—Portsmouth T.C. Electrically operated air conditioning and gas filtration plant at C.D. Main Control.—See 6 May issue.

12 June—Ashford (Kent) U.D.C. Street lighting equipment and installation.—See 27 May issue.

12 June—Cuckfield U.D.C. Street lighting schemes all in group B standard.—See 20 May issue.

12 June—Glasgow. Supply of electric cables, lamps, and welding electrodes during year from 1 July for Clyde Navigation Trust. Stores Superintendent, No. 1 Graving Dock, Glasgow.

12 June—Hucknall (Notts.) U.D.C. Rewiring at public library.—See 27 May issue.

12 June—West Hartlepool T.C. Street lighting equipment—See 27 May issue.

14 June—Ayrshire. Supply of electric lamps. County Clerk, Supplies Dept., County Buildings, Ayr.

14 June—Sale T.C. Stage lighting and wiring at town hall.—See 27 May issue.

14 June — Bentley-with-Arksey U.D.C. Electrical installation in 50 houses in Rosedale Rd and Queen's Drive. Surveyor, Council Offices, Cooke St, Bentley, nr, Doncaster. Deposit £2. 2s.

14 June—Sittingbourne and Milton U.D.C. Erection and installation of street lighting at various points.—Advertised in 27 May issue.

14 June—Wallasey T.C. Electrical installation at secondary technical school, Mosslands Drive. Borough Architect, Town Hall. Deposit £1. 1s.—Advertised in this issue.

14 June—West Riding. Rewiring of Heckmondwike school, Rothwell Micklethown school, and Rothwell Stourton school.—See 27 May issue.

14 June—Woodbridge (Suff.) U.D.C. Motor pump with fully automatic starter and fittings, etc.—See 27 May issue.

15 June—N. Cotswold R.D.C. Wiring and supply of fittings for 15 houses at Ebrington and Clapton-on-the-Hill.—See 27 May issue.

16 June—Leeds. Rewiring in preliminary training school at the Regional Hospital Board's' headquarters in Park Parade, Harrogate. Architect to Board, at that address. Deposit £2. 2s..

16 June—Manchester T.C. Two centrifugal pumps and other gear at Haweswater.—See 20 May issue.

16 June—Manchester T.C. Installations in 397 houses on Langley estate.—Advertised in 27 May issue.

17 June—Belfast. Installation in school in Whiterock Rd.—See 27 May issue.

18 June—Londonderry. Rewiring and supply and fixing light fittings at St. Eugene's Cathedral. Carr and M'Cormick, chart. architects, 7 Ferryquay St, Londonderry. Deposit £5. 5s.

19 June—Prestwich T.C. Supply of equipment for improved street lighting in Hilton Lane. Borough Engineer, Town Hall. Deposit £2. 2s.

19 June—Swansea T.C. Electrical installation in 40 flats at Gandros. Applications by above date to Borough Architect, The Guildhall. Deposit £2.—Advertised in this issue.

19 June—Swinton and Pendlebury T.C. Wiring and supply of fittings to 80 dwellings on Clifton estate.—Advertised in 27 May issue.

21 June—Ossett T.C. Street lighting in Bank and Dale Sts, and Market Place.—See 27 May issue.

21 June—Southall T.C. Sodium lamps, capacitors and transformers; concrete columns with installation of equipment. —Advertised in 27 May issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 112 queries answered this week

"F.A.L." fluorescent fittings and trunking, makers of? E.M.S.—Fluorescent Applications Ltd., 13 Liverpool Gdns, Worthing.

"Fingalite" lighting fittings for drawing boards, suppliers of? W.C.L.—Associated Drawing Materials and Equipment Ltd., 28 Victoria St, S.W.1.

Door bolt incorporating an electric switch for operating a remote sign, makers of? D.E.—We presume this refers to the bolt-operated door switch, made by: Simplex Electric Co., Ltd., Broadwell, Oldbury, Birmingham.

"Ultray" fires, suppliers of? L.E.B.—Well Fire and Foundry Co., Ltd., 15 Berners St, W.1.

"Chronas" clocks, repairers of? L.E.B.—Smith English Clocks Ltd., Sectric House, Waterloo Rd, N.W.2.

"Spot" vacuum cleaners, suppliers of? E.E.B.—Fleet Electrics Ltd., 32 Willesden Lane, N.W.6.

Pacera machine vice, makers of? S.B.C. —W. J. Meddings Ltd., Ipswich Rd, Slough, Bucks.

Wood engraving/burning pokers, makers of? T.B.C.—Acru Electric Tool Mfg. Co., Ltd., 123 Hyde Rd, Manchester 12.

21 June—West Riding. Rewiring of Ossett grammar school and Stocksbridge senior and J.M. and I. school. County Architect, Bishopgarth, Westfield Rd, Wakefield. Deposit £2. 2s.—Advertised in this issue.

22 June—Keswick (Cumb.) U.D.C. Supply and installation in Main St, of fluorescent lighting units.—Advertised in 27 May issue.

23 June—Sidmouth U.D.C. Installation of fluorescent and tungsten filament group B street lighting, including supply and erection, columns, lanterns, brackets, wiring and control gear. Engineer and Surveyor, Council Offices. Deposit £2. 2s.—Advertised in this issue.

24 June—Belfast T.C. Private automatic telephone system at Power Station West. —Advertised in 20 May issue.

3 July—Aberdare U.D.C. Supply of street lighting equipment to replace existing equipment. Engineer and Surveyor, Vestry Hall.—Advertised in this issue.

3 July—Mountain Ash (Glam.) U.D.C. Erection and completion of about 9½ miles of group A street lighting on main roads. Engineer and Surveyor, W. F. Greenway, Town Hall. Deposit £3. 3s.

No date stated—N. of Scotland H.E. Board. 11 kV and low voltage wood pole o.h. lines in Glen Esk and Glen Clora areas.—Advertised in 27 May issue.

No date stated—Stonehaven T.C. Electrical installation in eight blocks comprising 20 houses and 3 shops in Ardubine Rd. John A. W. Grant, chart. architect, 36 Melville St, Edinburgh, or Burgh Surveyor, Town Hall.

No date stated—Co. Tyrone. Installation at Hutton school, Beragh.—See 27 May issue.

No date stated—Oswaldtwistle U.D.C. Installation and erection of 51 400 W H.P.M.V. electric columns and brackets for public lighting scheme. Apply to T. D. Manning, Engineer and Surveyor, Town Hall.—Advertised in this issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

21 June—India. Tenders (E.223) invited for supply of 15,750 yd high tension cables, 123,400 yd of low tension cables, and considerable number of cable boxes, for Government of Madras Electricity Dept., Madras. B.o.T. (Ref.: ESB 13121/54).*

23 June—South Africa. Supply of 1,000 ft of ·25 sq in., 4-core l.t. paper insulated, lead covered, double steel tape armoured, anti-electrolysis and served cable, for Stores Dept. of S. African Railway. Tender No. C.7900. Chief Stores Superintendent, P.O. Box 8617, Johannesburg. B.o.T. (Ref.: ESB 1295/54).*

23 June—Uruguay. Supply and installation of a.c. group generator for Medical Services Centre. Tender No. 482 invited by Banco de Seguros del Estado on behalf of Govt. B.o.T. (Ref.: ESB 13124/54).*

24 June—South Africa. Supply of one 3-unit 11 k 250 MVA switchboard; two 500 kVA 11,000/400/231 V transformers; and one 16 panel H.R.C. fuse switchboard. Tender No. C.7788. Stores Dept., S. African Railways, Johannesburg. B.o.T. (Ref.: ESB 13393/54).*

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 1 June

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	240½	−½	252
„ (3 months)	238½	+½	—
LEAD, refined pig, min. 99·97% purity (cash)	98½	+3½	86½
„ (3 months)	96½	+2½	84½
TIN, refined, min. 99·75% purity (settlement)	725	−3	711½
„ (3 months)	723	−4	713½
ALUMINIUM, ingots 99-99·5%	150	—	161
ZINC, virgin, min. 98% purity (cash)	81½	+2½	71½
„ (3 months)	81½	+2½	71½
RUBBER No. 1, RSS. spot (per lb.)	18⅞d.	—	20⅛d.
„ c.i.f. basis, ports, August (per lb.)	18⅛d.	—	20⅛d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	51	—	50½
Mild Steel Tape (0·014 in.)	40	—	40

24 June—South Africa. Stores Department, S. African Railways, invite tenders (No. F6857) for supply of total of 158,900 ft of electric cable for motor vehicles. B.o.T. (Ref.: ESB 12803/54).*

24 June—South Africa. Supply of total of 46,400 ft of cable to various specifications for Stores Dept. of S. African Railways, Johannesburg. Tender No. C.7837. B.o.T. (Ref.: ESB 12830/54).*

15 July—Costa Rica. Costa Rican Electricity Inst. invite tenders (No. 93) for supply of hydro-electric plant at La Garita. B.o.T. (Ref.: ESB 12302/54).*

July—Australia. Supply, testing, etc., of 3 electrically driven circulating water pumps with motors, for steam turbine condenser, etc., cooling water system proposed for Bunbury power station of State Electricity Commission of Western Australia. (Schedule No. 192A 1954.) B.o.T. (Ref.: ESB 12687/54).*

2 Aug.—Pakistan. Supply, construction, erection, etc., of a turbo-alternator set with steam raising plant, four boilers and boiler room equipment, switchgear, cables, etc., and spares, for Saidpur power station, Eastern Bengal Railway. Tender No. ENG.X/28029/53. Dept. of Supply and Development, Govt. of Pakistan, Karachi.

3 Aug.—Philippines. Supply of hydraulic turbine, governor and inlet valve, generator, power transformer and substation service equipment for Lake Buhi-Barit hydro-electric river project No. 1, Camarines Sur, Luzon. B.o.T. (Ref.: ESB 12953/54).*

Date not stated—U.S.A. Seattle Lighting Dept. will be inviting tenders (No. B24) for supply of 46 34·5 kV disconnecting switches. B.o.T. (Ref.: ESB 13203/54).*

Contracts Placed

B.E.A. High pressure pipework and valves at Brighton B, and at E. Yelland, C. A. Parsons and Co., Ltd.; Ocker Hill high pressure steam and feed pipework and valves, Aiton and Co., Ltd.; 6·6 kV compound filled auxiliary switchgear at Ferrybridge B, South Wales Switchgear, Ltd.; Two 60,000 kW turbo-alternator sets, condensing and feed heating plants at Chadderton, Metropolitan-Vickers Electrical Co., Ltd.; 33 kV switchgear at Hartshead, Ferguson Pailin, Ltd.; and 132 kV 2,500 MVA switchgear at Windyhill (Glasgow) substation, Metropolitan-Vickers Electrical Co., Ltd.

Manchester T.C. Electrical installation at Park End Hse, Didsbury Training College, A. E. Sudlow and Co. Ltd. (previous tender withdrawn); also same in shops and flats on Langley estate, and 324 dwellings on same estate, F. L. Bampton Ltd.

Todmorden T.C. Supply and erection of steel columns and brackets with wiring of electrical equipment along trunk road, Ben L. Oliver, £7,588; also supply of equipment for same scheme, Revo Electric Co. Ltd., £2,120.

Hertford T.C. Rewiring of 101 houses on Bengeo estate, Eastern Electricity Board, £2,309.

Ryton-on-Tyne U.D.C. Electrical installations in 61 houses on Park Field North estate, Tindall, Son and Telford.

Durham. Installation at Highington Redworth Hall special residential school. R. Robson, £1,937.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Styrex. 726,660. Class 9. Separators for electric batteries. Tungstone Products Ltd., St. Bride's Hse, Salisbury Sq, E.C.4.

Quo Vadis. 728,102. Class 9. Scientific, nautical, surveying and electrical apparatus and instruments, etc. Marconi International Marine Communication Co. Ltd., Marconi Hse, 336 Strand, W.C.2.

Selvox. 728,584. Class 9. Apparatus and instruments for recording and reproducing sound, etc. British Universal E.M.E. Ltd., 36, Victoria St, S.W.1.

Fluoreston. 728,646. Class 11. Fluorescent lighting apparatus and parts thereof and fittings therefor. J. Stone and Co. (Deptford) Ltd., Deptford, S.E.14.

The Yorkshire Grey in design. 727,051/79,235. Class 12. Diesel electric locomotives and parts. Yorkshire Engine Co. Ltd., Meadow Hall Works, Wincobank, Sheffield.

Spec. 726,495. Class 9. Electrical apparatus and instruments. Scottish Precision Eng. Co., 27 Cadogan St, Glasgow C.2.

Hec. 727,663. Class 9. Electronic computors. British Tabulating Machine Co. Ltd., 17 Park Lane, W.1.

Lady Margaret 728,741 and **Regatta** 728,742. Class 9. Wireless, television and telegraphic instruments, etc. Vidor Ltd., West St, Erith, Kent.

B.S. in design. 726,554. Class 11. Standards for floor and table lamps. B. Szeps Ltd., 40a Boundary Rd, N.W.8.

BUSINESS PROSPECTS

Home

Ashby-de-la-Zouch U.D.C. Scheme approved for 267 houses, an old people's home, ten bungalows and shopping centre on Tamworth Rd site.

Belfast. Ministry of Agriculture has approved erection of additional storey to agricultural buildings at Queen's University. Estimated cost £40,000.

Burnley. Factory costing over £1¼ millions to be built at Padiham for N. Western Industrial Estates Ltd. for occupation by Mullard Blackburn Works Ltd.

Caernarvonshire. Planning permission granted for construction of residential estate at Morfa Bychan. Architect is Lindsay Bullivant, 103 Bristol Rd, Birmingham, and estimated cost £500,000.

Cardiff T.C. Construction of 16 dwellings at Ely North. City Surveyor's Office, City Hall.

Coventry. Singer Motors Ltd. are planning to rebuild their premises.

Croydon. Barnard and Smith, 50 Knightsbridge Ct, S.W.1, are architects for factory and offices on New Addington estate for L. Newman Ltd.

Darlaston (Staffs.) U.D.C. Tenders to be invited for erection of 100 houses.

Deben (Suff.) R.D.C. Scheme approved for erection of 61 houses at Kesgrave.

Edinburgh T.C. Erection of 40 houses in Restalrig Ave and Fillyside Gdns. City Architect, City Chambers.

Edmonton T.C. Layout plans prepared for three stages of scheme for 468 dwellings at Snells Park, and for 102 dwellings at Potters Bar.

Exeter T.C. Approval given to erection of 450 houses on new estate near Beacon Lane. C.C. proposes to erect new offices at Bellair and Coaver, Topsham Rd, at estimated cost of £500,000.

Glasgow. Plans approved for erection of two further stories to factory in Customhouse Rd, for D. and H. Cohens Ltd.

Grimsby. Plans being prepared for erection of factory for Courtaulds Ltd., 16 St. Martin's-le-Grand, London, E.C.1. Building expected to start in about six months and take over two years to complete.

Halstead (Essex). Plans approved for new R.C. church in Colchester Rd.

Hambledon (Sur.) R.D.C. Revised plans in hand for erection of 58 dwellings at Clappers' Meadow, and 64 at Elstead Nursery.

Harrow T.C. Application to be made to borrow £83,610 for erection of 44 dwellings at Stonegrove, Edgware.

Haverfordwest T.C. Approval received for erection of 72 dwellings in Kenton Lane.

Hawick (Roxburgh). Dean of Guild Court has approved extension to Teviot Rd factory of R. Pringle and Son Ltd. Estimated cost £32,000.

Hemel Hempstead. Tenders may soon be invited for erection of divisional police station. Estimated cost £78,100.

Heywood (Lancs.). Plans in hand for erection of shirt factory in Miller St for Longdura Manufacturing Co. Ltd. of Manchester.

Hull. Priestman Bros. Ltd., Thomas St, are to carry out extensions at Marfleet. Holdsworth, Son and Partners, 255 Beverley Rd, are quantity surveyors. Cost estimated at £400,000.

Kirkcaldy. Plans approved for £469,764 high school.

Leicester T.C. Approval given to erection of telephone exchange near Lee St car park. Estimated cost £500,000.

Leominster T.C. Revised plans to be prepared for erection of 136 houses on Westfield Walk site.

Liverpool T.C. Application to be made to borrow £2,770 for improvement to lighting installations at schools.

Londonderry T.C. It is proposed to build 48 houses at Meenan Park, 6 at De Burgh Terrace and 97 at Westway, Geggan estate. Further plan for 122 houses and shopping centre at Cloughglass is envisaged.

Merthyr Tydfil T.C. Erection of infant school at Cellideg. Borough Engineer and Surveyor, Town Hall.

Middlesbrough. Additions to General Hospital for Newcastle Regional Hospital Board. P. H. Knighton is Board's chief architect at "Dunira," Osborne Rd, Newcastle.

Newcastle-on-Tyne. Negotiations in progress for property near Central Railway Station for combined bus and helicopter station to cost about £250,000. Proposal approved in principle by Ministry.

Newcastle-on-Tyne. £30,000 scheme approved for improvements and additions at the Eye Infirmary.

N. Ireland. Erection of 255 houses at Rathcoole, 5a Whitehouse, Belfast. N.I. Housing Trust, 12 Hope St, Belfast.

Northants. Police station costing about £61,000 to be built at Corby.

North Riding. Stinton, Jones and Partners, 21 Gloucester Place, London, W.1, have been appointed mechanical and electrical consultants for Cleveland Technical College.

Perivale (Middx.). Trepur Ltd. propose to build factory and offices at estimated cost of £70,000. Architects are Bostock and Partners, Central Hall Buildings, Station Approach, Southall.

Plymouth T.C. It is proposed to erect 400 houses, school and shops at Egg Buckland. Schemes also in mind for 86 houses at Granby Barracks and further 100 at same place.

Ross-on-Wye U.D.C. Plans being prepared for 86 dwellings in Walcot Rd.

Sedgefield R.D.C. Erection of 37 houses at Trindon Colliery, six shops and flats at W. Cornforth and ten shops and ten flats at Trindon Village.

Shoreditch. Adaptations and extensions at Cordwainers Technical College is estimated to cost £87,514.

Southport T.C. Tenders may soon be invited for installation of electricity in 97 houses on Canning Rd, Lytham Rd and Shaw Rd estates.

Stockton-on-Tees T.C. Work expected to start on new municipal buildings next year. First stage will cost £150,000.

Sutton (Sur.). It is proposed to erect new fire station along by-pass.

York. Plans submitted by Rowntree and Co., Ltd., for additions of fourth and fifth floors at their cocoa works.

Overseas

Germany. Elna GmbH, Hamburg 11, Englische Planke 4, wish to contact U.K. suppliers of marine electrical equipment including switchboard fuse equipment 25 to 100 amps; water tight plugs and sockets (10 amps) for deck and engine rooms and cabins; same (60 amps) for current coming from shore; and ceiling and wall lamps for cabins.

Gazette Announcements

COMPANIES ACTS

Supreme Refrigeration Co. Ltd. Meetings of members and creditors will take place at Harry L. Price and Co., 47 Mosley St, Manchester, on 1 July, at 2 p.m. and 2.15 p.m., respectively, to receive liquidator's report.

Wembley Electrical Appliances Ltd. Last day for receiving proofs in respect of intended dividends is 14 June. Liquidator is E. T. Wood, 7 and 8 Chandos St, London, W.1.

T. and R.T.S. Ltd. Resolution for voluntary winding-up passed at meeting on 17 May. B. Phillips of 76 New Cavendish St, London, W.1, has been appointed liquidator at subsequent meeting of creditors, and all creditors are asked to send particulars to him by 25 June.

Domestilux Ltd. Special resolution for voluntary winding-up passed at meeting on 16 Feb, when T. A. Moodie of Moodie, Epstein and Partners, 203 Regent St, London, W.1, was appointed liquidator.

Russell Bros. (Ryde) Ltd. At meeting on 20 May, resolution was passed for winding-up, and A. H. Cross, cert. acc, of 30 High St, Newport, I.o.W, was appointed liquidator.

Midland Wireless and Electrical Appliance Co. Ltd. Meetings of members and creditors will be held at offices of Leeds Barlow and Co. C.A., 66 Alma St, Luton, on 30 June at 11 a.m. and 11.15 a.m. resp.

BANKRUPTCY ACTS

Receiving Orders

Leeds. Samuel Whitton and Leslie Whitton trading together as F. Whitton and Sons, electrical engineers at Church Place, Victoria Rd, Leeds. Date of receiving order, 24 May.

Southend. Robert B. Haill, electrical contractor trading at 3 Lord Roberts Ave, Leigh-on-Sea. Date of receiving order, 21 May.

First Meetings

Huddersfield. Donovan J. Hartshorne, electrical and mechanical engineer trading as Boyce, Weir and Co, at 778 New Hey Rd, Huddersfield, and at Brook Royd Mills, Stainland, nr, Halifax. First meeting will be at Official Receiver's Office, 20 North Parade, Bradford, tomorrow (4 June) at 11 a.m. Public exam at County Court Hse, Queen St, Huddersfield, on 21 July at 10.30 a.m. Receiving order dated 24 May.

Torquay. George Frankis and Bernard W. V. Smith, trading together as Brixham Electric Service at 4 The Strand, and 9 Fox's Court, Union Lane, Brixham. First meeting at 12 Pennsylvania Rd, Exeter, tomorrow (4 June) at 11 a.m. Public exam at New Town Hall, Torquay, on 16 July at 2 p.m. Date of receiving order was 19 May.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

C. A. Spooner, Ltd., 2 Rowan Cres, Streatham, S.W.16. Electrical engineers and contractors, etc. Nom. cap.: £100. Dirs.: C. A. Spooner and Mrs H. V. Spooner.

H.G.B. Electronic Ltd., 40 Dagnall Park, Selhurst, S.E.25. Nom. cap.: £100. Dirs.: L. P. Bush, F. W. Holland and H. D. V. Gould.

A. B. Davenport (Electrical Contractors) Ltd., 468a Didsbury Rd, Heaton Mersey, Stockport. Nom. cap.: £2,000. Dirs.: A. B. Davenport and F. L. Bampton.

Multivendors Ltd., 1-4 Copthall Chmbrs, E.C.2. Manufacturers of and dealers in coin-actuated vending machines, scientific and general glassware apparatus, neon and luminous tubes and electrical apparatus, etc. Nom. cap.: £2,500. Dirs.: E. J. Camp and N. C. Brooks.

Relator Ltd., Century Hse, St. Peter's Sq, Manchester. Manufacturers of calculating, recording or accounting machinery operated by manual, mechanical and electrical appliances, etc. Nom. cap.: £5,000. Dirs.: F. Eaton, E. A. Jones and E. Lee.

Mann Egerton Electronics Ltd., 5 Prince of Wales Rd, Norwich. Nom. cap.: £5,000. Dirs.: W. A. Paton, K. T. Boardman, H. H. Chapman and F. J. W. Lager.

TRADE NOTES

Changes of address. The main Service Department of Vactric Ltd. has moved to new premises at 35 Sunbeam Rd, N.W.10. Telephone Elgar 3411.

The Aberdeen branch of the Briterlite Electrical Co. (Glasgow) Ltd., has moved to 52 Regent Quay, Aberdeen. Telephone No. 50257/8.

As from 1 June, the London offices of the Key Engineering Co. Ltd. are established at 4 Newgate St, E.C.1. The telephone number remains City 1185.

New Showroom. J. Rivlin Ltd. have opened a showroom at 25 King St, Leeds, where their window lighting fittings, in addition to domestic appliances and other goods are displayed.

Holidays. The Denis Ferranti Co. Ltd. Transformer Works at Royton, Lancs, will be closed for the annual summer holidays from midday Friday, 18 June, until Monday, 5 July. No goods will be received or despatched during this period which coincides with Oldham Wakes.

Change of Name. G. M. Engineering (Ottery St. Mary) Ltd. have changed their name to Ottermill Switchgear Ltd. The London office remains at 1 Victoria St, Telephone Abbey 5095/6.

Electronics Development. In view of the expansion of electronics business in Scotland, a new company Elesco Electronics Ltd., has been formed to act as selling organisation for Land, Speight and Co. Ltd., for the electronic and electrical equipment which they handle. Mr A. A. M. Turnbull, formerly general manager of the later company, becomes managing director of the new concern, with Mr W. O. Buchanan as technical sales manager and Mr R. W. Newton on liaison duties. Mr Turnbull continues as commercial manager for Land, Speight and Co. Ltd.

Electro Mechan-Heat Ltd., Lower Teddington Rd, Hampton Wick, Mdx. Electrical, mechanical, general, radio, wireless, television and telephonic engineers and contractors, etc. Nom. cap.: £1,000. Dirs.: to be appointed by subscribers. Subs.: J. C. Clark and R. W. Cairns.

J. M. Coston and Co., Ltd., 35 Kensington Rd, Kings Lynn, Norfolk. Plumbers, electricians, sanitary and heating engineers, etc. Nom. cap.: £3,000. Dirs.: J. M. Coston, Eileen P. Coston, H. E. P. Moule and K. T. Hughes.

Harry F. Dent Ltd., 144 New St, Burton-on-Trent. Electrical engineers and contractors, etc. Nom. cap.: £5,000. Permanent dirs.: H. F. Dent and Mrs M. A. Dent.

Massey Wenk Co., Ltd. Wireless, radio, television, electrical, domestic and household goods dealers, etc. Nom. cap.: £100. Dirs.: not named. Subs.: C. G. Walton and F. Rhodes, 35-7 King St, Luton.

Waddington (Newton Abbot) Ltd., 85 Queen St, Newton Abbot. Manufacturers of and dealers in electrical and mechanical apparatus, etc. Nom. cap.: £100. H. H. Reynolds 21 Golvers Hill Rd, Kingsteignton, Devon, signs as director.

Audio Transducers Ltd., Piccadilly Hse, 33-7, Regent St, S.W.1. Electrical, radio, acoustic and general engineers, etc. Nom. cap.: £1,000. Dirs.: H. J. Leak, J. F. Hawkins and G. Haus.

H. W. Norman (Bristol) Ltd. Designers and manufacturers of and dealers in neon and scintillating electric signs, etc. Nom. cap.: £3,500. Dirs.: H. W. Norman, Talbothayes, Stoke Bishop, Bristol 1, and F. W. Gardner, 4 Windsor Terr, Clifton, Bristol 8.

Douglas Gill of West Kirby Ltd., Column Rd, West Kirby. Electrical engineers and contractors, manufacturers of and dealers in telephonic and sound reproducing machines, television and radio sets, etc. Nom. cap.: £1,000. Dirs.: D. Gill and Beryl E. Gill.

H. & M. Samuel Ltd., 123 Hanley Rd, Stroud Green Rd, N.4. Manufacturers of and dealers in motor car lamps, electric bulbs, clocks, etc. Nom. cap.: £500. Dirs.: S. Samuel and M. Samuel.

Rotheroe & Mitchell Ltd. Manufacturers of electrical and mechanical scientific instruments, engineers, etc. Nom. cap.: £30,000. Dirs.: J. R. Rotheroe, E. D. T. Vane and A. F. Bowman. Subs.: J. A. H. Hortin and E. Easterbrook, 43-4 Albemarle St, W.1.

Trenton Television Ltd., 11 Tennyson Mnsns, Queen's Club Gdns, W.14. To take over business of radio, electrical and television engineer carried on at 329 Kilburn La, W.9 by Harold F. Grainge. Nom. cap.: £2,000. Dirs.: H. F. Grainge, Mrs J. Grainge and Miss A. Denton.

Huntley's (Old St) Ltd., Town Hall Chmbrs, 374 Old St, E.C.1. Manufacturers of and dealers in advertising and display goods, electrical appliances, etc. Nom. cap.: £500. Dirs.: A. J. Huntley and Mrs M. L. Huntley.

A. P. Last and Sons Ltd., 237 Westbourne Grove, W.11. Electrical engineers, electricians, etc. Nom. cap.: £2,000. Dirs.: A. P. Last, Mrs M. J. Last and B. P. Last.

Power Auxiliaries Ltd., 56 Vicarage La, Ilford. Manufacturers of and dealers in mechanical and electrical appliances for handling, conveyance, storage, purifying, compression, heating or cooling of air, steam, water, etc. Nom. cap.: £1,000. Dirs.: to be appointed by subs. Subs.: M. T. Slater, 105 Cranbrook Rd, Ilford and W. J. Pearman, 21 Hazelmere Gdns, Hornchurch.

Telefficiency (Gt. Brit.) Ltd., Phœnix Works, 19-23 Oxford St, W.1. Television maintenance and engineers, electrical engineers, etc. Nom. cap.: £200. Dirs.: W. Trigar and Mrs I. V. Trigar.

Truchord Ltd., 124 New Bond St, W.1. Manufacturers of and dealers in electrical goods, wireless and television sets, etc. Nom. cap.: £100. Dirs.: R. D. Farrant and Barbara Farrant.

Northern Fluorescent Co. Ltd. Manufacturers of and dealers in electrical, fluorescent and tungsten lamps, fittings and equipment, etc. Nom. cap.: £100. Dirs.: not named. Subs.: J. R. T. Cuthbert, 132 Firs La, Winchmore Hill, N.21 and L. G. Pizzey, 138 High Rd, Chiswick.

Maudell Arts Ltd., Haymarket Ct, 31-2 Haymarket, S.W.1. Manufacturers of and dealers in electrical goods of all kinds, etc. Nom. cap.: £100. Dirs.: S. Mandell and N. Tookman.

V. P. Tools and Components Ltd., 254 Croydon Rd, Wallington, Surrey. General, mechanical and electrical engineers, toolmakers, etc. Nom. cap.: £1,000. Dirs.: F. H. J. Vincent and Mrs K. Vincent, B. T. Pamplin and Mrs M. A. Pamplin.

Nikad Supplies Ltd., Senior Works, Church Rd, Staines, Mdx. Electrical engineers, etc. Nom. cap.: £2,500. Permt. dir.: L. P. Goddard.

Norcold (Sales) Ltd., 1518 London Rd, Norbury, S.W.16. Manufacturers of and dealers in motor car lamps, electric bulbs, clocks, mats and rugs, etc. Nom. cap.: £100. Dirs.: J. A. Trapman, A. F. Cook and L. H. Hodgson.

Galham Electrical Co. Ltd., High St, Southall, Middx. Manufacturers of and dealers in mechanical apparatus, in particular wireless and radio sets and valves, television sets, etc. Nom. cap.: £1,000. Dirs.: W. E. J. Gale and Winifred H. Gale.

Duigman and Hall Ltd., 136 North Hill Drive, Harold Hill, Romford. Importers and exporters of and dealers in electrical washing and cleaning machines and electrical apparatus of all kinds, etc. Nom. cap.: £100. Dirs.: J. R. Duigman and T. J. Hall.

Good Looking Ltd., Exeter Lodge, Exeter Rd, Bournemouth. Electrical, mechanical, radio, television and general engineers, etc. Nom. cap.: £100. Dirs.: D. H. Crisp and O. H. Tramontini.

MEETINGS TO NOTE

TUESDAY, 8 JUNE

INCORP. PLANT ENGINEERS (Manchester).—"Peak Loads and Heat Storage." W. Goldstern. Engineers' Club, Albert Sq, 7.15 p.m.

THURSDAY, 10 JUNE

INCORP. PLANT ENGINEERS (N. East).—"Planned Maintenance System." T. F. Hutchinson, Roadway Hse, Oxford St, Newcastle, 7 p.m.

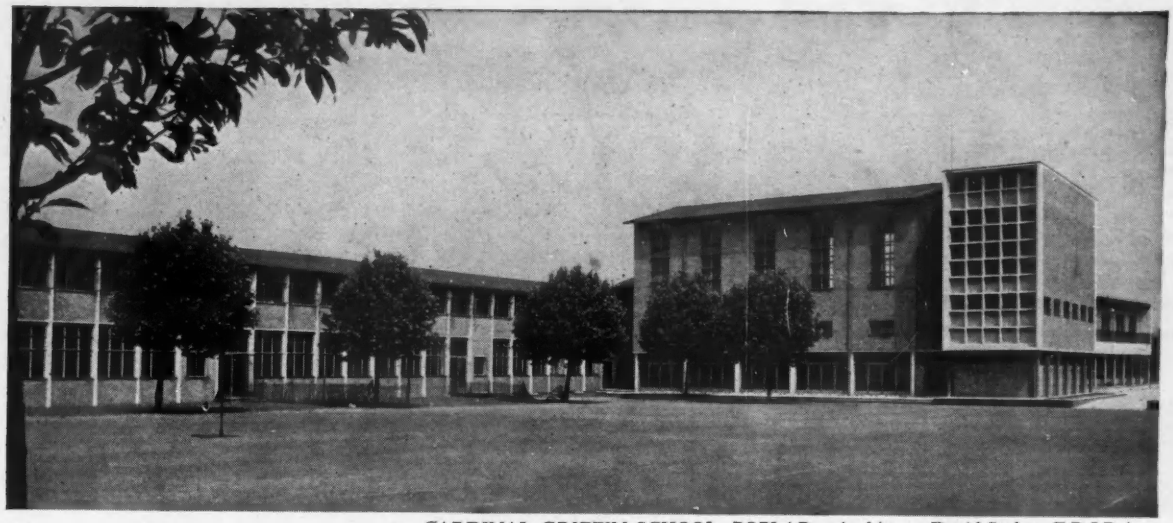
FRIDAY, 11 JUNE

I.E.E. (Southern).—Summer meeting at Reading. Luncheon at Grosvenor Hotel, Caversham, 12.30 p.m.

I.E.E. (London Measurements).—Section summer visit.

FRIDAY, 18 JUNE

I.E.E. (London Education).—Exhibition of apparatus. Engineering laboratory of Battersea Polytechnic at 6 p.m.



CARDINAL GRIFFIN SCHOOL, POPLAR. Architect: David Stokes, F.R.I.B.A.

In the modern manner

This school in London's east-end and the new building in Fitzroy Square typify the modern idiom in architecture.

BY APPOINTMENT ELECTRIC CABLE MANUFACTURERS TO THE LATE KING GEORGE VI

Wired throughout with

HENLEY CABLES

Electrical Contractors:

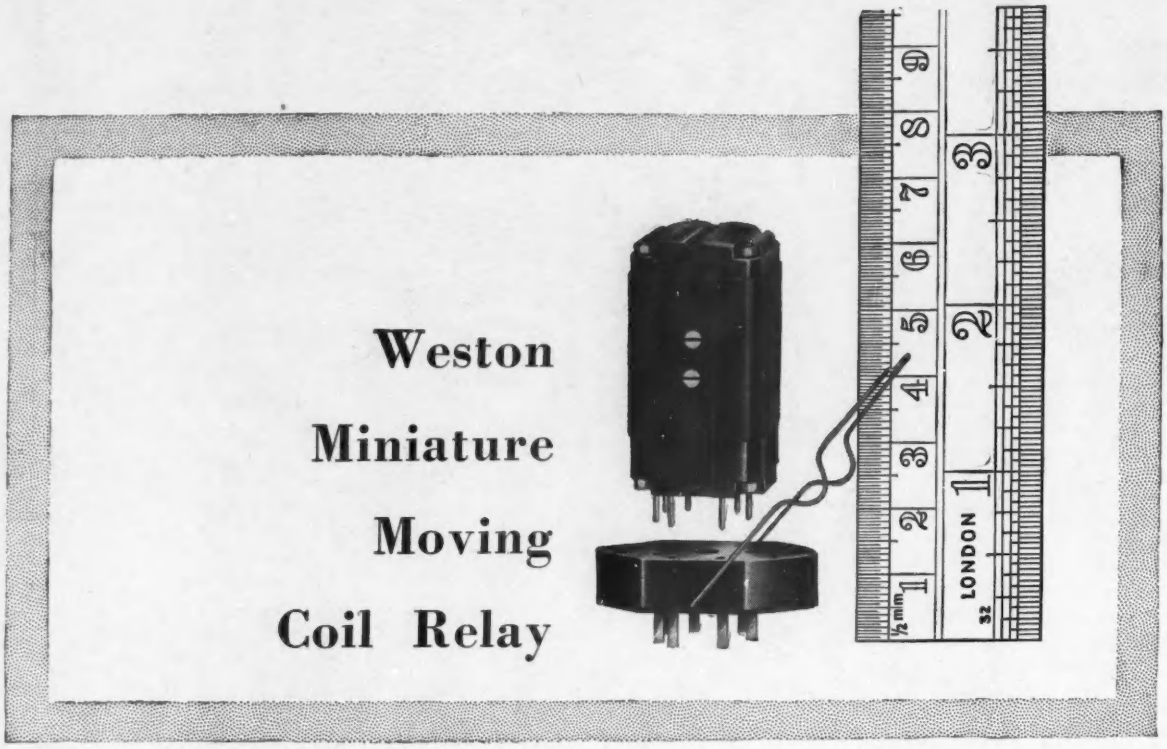
TROUGHTON & YOUNG LTD.

KNIGHTSBRIDGE, S.W.3.

Y.M.C.A. INDIAN STUDENTS' HOSTEL
Fitzroy Square, W.1.
Architect: Ralph Tubbs, O.B.E., F.R.I.B.A.

B. E. P. Convention Stand No. 8

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1



The "Weston" Model S.115 Miniature Moving Coil Relay functions as a sensitive "on-off" current switch, and will operate on a power input of only 5 microwatts. Generally the relay is supplied with a centre stable moving contact, but a biased version which affords a single break, or a break followed by a make, is also available. The moving coil can be provided with two windings which offer considerable scope in circuitry. The relay has a seven pin base and is supplied with a separate chassis or panel mounting socket with retaining clip: mounting position is unimportant. Size $1\frac{1}{2}$" x $\frac{3}{4}$" x $2\frac{1}{4}$", weight $1\frac{3}{4}$ oz. only. List No. W.46 gives further particulars and is available on request, but these relays give best service when they are specially designed to suit the circuit in which they are to be used, and we shall be delighted to co-operate on receipt of the pertinent information.

Other WESTON relays

MODEL S54. A relay of extreme sensitivity (size 4-1/5" x 3-1/5"). The high torque developed by the moving system ensures positive contact pressure. Leaflet — List No. W.45 gives details.

MODEL S124. A sensitive relay (size 2-3/16" x 2-3/16") with magnetic hold-on contacts having a higher rating than the other models. Leaflet — List No. W.43 gives details.

SANGAMO WESTON LIMITED

ENFIELD, MIDDLESEX · TEL: ENField 3434 (6 lines) & 1242 (6 lines) GRAMS: SANWEST, ENFIELD

Scottish Factory: Port Glasgow, Renfrewshire. Port Glasgow 41151

Branches: London, CHAncery 4971 · Glasgow, Central 6208 · Manchester, Central 7904 · Newcastle-on-Tyne, Newcastle 26867 · Leeds, Leeds 30867 · Liverpool, Central 0230 · Wolverhampton, Wolverhampton 21912 · Nottingham, Nottingham 42403 · Bristol, Bristol 21781 · Southampton, Soton 3328 · Brighton, Brighton 28497

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

SIDMOUTH URBAN DISTRICT COUNCIL

STREET LIGHTING, GROUP "B"

TENDERS are invited for the installation of Fluorescent and Tungsten filament lighting including the supply and erection of columns, lanterns, brackets, wiring and control gear.

Plans and general conditions of contract may be inspected and specifications, bills of quantities and form of tender obtained from the Engineer and Surveyor, Council Offices, Sidmouth, on payment of a deposit of two guineas, which will be returned on receipt of a bona fide tender and the return of all documents.

Tenders in plain sealed envelopes endorsed "Street Lighting" must be delivered to the undersigned not later than 12 noon on Wednesday, 23 June, 1954.

The lowest or any tender will not necessarily be accepted.

R. PICKARD,
Clerk of the Council.

Council Offices,
Sidmouth.
25 May, 1954. (K 56)

BOROUGH OF BARKING

STREET LIGHTING

TENDERS are invited for the provision and erection of 25 No. 400 W Mercury Vapour Lamps on concrete columns on the B.1367 route North St, Barking, to the Ilford Boundary.

Application for tender documents should be made to the Borough Engineer, Town Hall, East St, Barking. Tenders must be delivered to the undersigned in the envelopes provided, not later than 11 June, 1954.

The Council does not bind itself to accept the lowest or any tender.

E. R. FARR,
Town Clerk.
(K 92)

COUNTY COUNCIL OF THE WEST RIDING OF YORKSHIRE

TENDERS are invited for the Re-wiring of the Electrical Installation at the undermentioned Schools:

1. Ossett Grammar School.
2. Stocksbridge Senior and J. M. and I. School.

Specifications with plans, together with Conditions of Tender, may be obtained on application to the County Architect, Bishopgarth, Westfield Road, Wakefield, on payment of a deposit of £2. 2s. which will be returned on receipt of a bona fide tender. Cheques must be made payable to the West Riding Treasurer and crossed "& Co."

Sealed tenders must be addressed to me, the undersigned and received at Room 3, County Hall, Wakefield, not later than 10 a.m. on Monday, 21 June, 1954.

BERNARD KENYON,
Clerk of the County Council.
(K 57)

ABERDARE URBAN DISTRICT COUNCIL

PUBLIC LIGHTING

TENDERS are invited for the supply and delivery of items of public lighting equipment to replace existing equipment.

Schedules of requirements and tender form may be obtained from the Engineer and Surveyor to the Council, Vestry Hall, Aberdare.

Tenders, in plain sealed envelopes endorsed "Public Lighting Equipment" must reach me before noon on Saturday, 3 July, 1954.

D. G. JAMES,
Clerk of the Council.

Town Hall,
Aberdare.
1 June, 1954. (K 72)

COUNTY BOROUGH OF WALLASEY

ELECTRICAL INSTALLATION AT: SECONDARY TECHNICAL SCHOOL, MOSSLANDS DRIVE

TENDERS, to reach the undersigned by 14 June, 1954, are invited for the above. Specification and Form of Tender obtainable from the Borough Architect, Town Hall, Wallasey, on payment of a deposit of £1. 1s. The deposit is returnable on receipt of a bona fide tender, not subsequently withdrawn, or the return of documents prior to the closing date.

A. G. HARRISON,
Town Clerk.
(K 91)

COUNTY BOROUGH OF SWANSEA

TENDERS FOR ELECTRICAL INSTALLATION 40 FLATS AT GENDROS, SWANSEA

FIRMS wishing to tender for the Electrical Installation for 40 Flats at Gendros, Swansea, are invited to submit their applications to the Borough Architect, The Guildhall, Swansea, on or before Saturday, 19 June, 1954.

Plans, Specification and Conditions of Contract can be obtained on application and deposit of £2, provided the applicant gives satisfactory evidence of having previously carried out work of a similar character.

The deposit will be refunded after delivery of a bona fide Tender (which is not subsequently withdrawn) and the return of all documents.

No guarantee is given that the lowest or any other Tender will be accepted.

T. B. BOWEN,
Town Clerk.

The Guildhall,
Swansea.
25 May, 1954. (K 64)

OSWALDTWISTLE URBAN DISTRICT COUNCIL

PUBLIC LIGHTING SCHEME 1954/55

TENDERS are invited for the installation and erection of 51-400 W H.P.M.V. Electric Column and brackets in connection with the above mentioned scheme. Conditions of Contract, Specifications and Form of Tender may be obtained on application to T. D. Manning, M.I.MUN.E., Engineer and Surveyor, Town Hall, Oswaldtwistle.

The Council does not bind itself to accept the lowest or any tender.

H. DUXBURY,
Clerk to the Council.

Town Hall,
Oswaldtwistle.
(K 58)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

YORKSHIRE ELECTRICITY BOARD

Head Office

APPLICATIONS are invited for the position of PRINCIPAL ASSISTANT (Administrative) at the Head Office of the Board.

Applicants should have administrative experience in the Electricity Supply Industry preferably at Sub-Area and/or District level.

Salary—N.J.C. Grade 9, £1,000/£40/£1,120 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Secretary, Yorkshire Electricity Board, Wetherby Rd, Scarcroft, Leeds, not later than 17 June, 1954.

No. 4 (Leeds) Sub-Area

Leeds District
GENERAL ASSISTANT ENGINEERS
(1 vacancy Leeds N.E.)
(1 vacancy Morley)

Applicants should preferably be Graduates of the Institution of Electrical Engineers and have experience in the construction, operation, maintenance and planning of overhead and underground distribution systems in densely populated industrial and residential areas. Experience of rural development will be an added advantage.

Salary—N.J.B. Class J, Grade 11, £639/£665 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds), Sub-Area, Yorkshire Electricity Board, Bramhope, Leeds, not later than 17 June, 1954.

No. 5 (Wakefield) Sub-Area

Castleford District
THIRD ASSISTANT DISTRICT ENGINEER

Applicants must have had a sound practical training with experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Applicants must hold a current driving licence, be prepared to reside in the district and undertake standby duties.

Preference will be given to those who are Corporate Members of the Institution of Electrical Engineers or who hold equivalent qualifications.

Salary—N.J.B. Class E, Grade 9, £587/£600 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield), Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 17 June, 1954. (K 67)

BRITISH ELECTRICITY AUTHORITY

Yorkshire Division

REQUIRE a GENERAL ASSISTANT ENGINEER (Electrical) in the Generation Construction Department at Rotherham.

Salary £501/£694 per annum. Class AX/DX, Grade 8, National Joint Board Agreement (Schedule C).

Applicants should have had a sound technical training and preferably be Graduates of the Institution of Electrical Engineers or equivalent, and be experienced in modern power station electrical equipment and drawing office practice.

Application forms obtainable from the Divisional Secretary (Establishments), British Electricity House, St. Mary's Rd, Leeds 7, to be returned within 14 days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.
(K 89)

CITY COUNCIL OF SINGAPORE
ELECTRICITY DEPARTMENT

APPLICATIONS are invited for the post of BOILER HOUSE SHIFT ENGINEER in the City Electricity Department, appointment in the first instance being on 3 years' agreement. On satisfactory completion of the agreement the appointee would normally be offered emplacement on the permanent establishment.

Applicants must possess First Class Board of Trade Steam Certificate and Graduate Membership of the Institution of Mechanical Engineers, or Higher National Certificate (Mechanical) or equivalent and must have experience in the operation of large modern high pressure oil/coal fired boiler plant. Minimum age: 24.

The salary offered is $660, $690 and $720 a month for the 1st, 2nd and 3rd year respectively. Expatriation and cost of living allowances at such rates as may be approved by the Council from time to time are payable. The existing rates are as follows:

Expatriation Allowance: £287 per annum on basic salaries up to $720 a month.

Present rate of Cost of Living Allowance payable on basic salary between $660 and $720 a month is £238 per annum for a single man, £345. 16s. to £362. 12s. per annum for a married man; £466. 4s. to £495. 12s. per annum for a married man with one or more dependent children. (A dependent child means an unmarried child, including a step child or a legally adopted child, under the age of 17, or receiving full time educational instruction and below the age of 21.)

For a single man the minimum total emoluments on a basic salary of $660 a month would amount to £1,449 per annum; for a married man with no children £1,556. 16s. per annum and for a married man with one or more children £1,677. 4s. per annum.

The exchange rate is approximately $1 to 2s. 4d. sterling.

Partly furnished quarters provided if available at 6% of basic salary or Housing Allowance of 10% of basic salary (subject to a maximum of $120 p.m.) paid in lieu.

Free passages will be provided for appointee, his wife and his own children under the age of 12 years at the date of sailing subject to a maximum of three full passages.

Leave: One month per year of service may be granted on satisfactory completion of agreement at the discretion of the Council. If placed on the permanent establishment on completion of the agreement the appointee will be required to serve a further year before proceeding on leave. The present rate of leave is 4 days per month of resident service. Local leave of 14 days a year cumulative to a maximum of 28 days may also be granted.

Compulsory Provident Fund contributions at present 7½% of salary (but not allowances) to which the Council donate 7½% rising to 10% after 10 years' service, 15% after 15 years' service and 20% after 20 years' service. This scheme is under review.

Applications in duplicate giving full information regarding age, experience, qualifications and personal circumstances with copies of 3 recent testimonials also in duplicate to Messrs Allen and Williams, 1 Victoria St, London, S.W.1, before Tuesday, 29 June, 1954. (K 46)

BRITISH ELECTRICITY AUTHORITY
South Western Division

STATION SHIFT CONTROL ENGINEER required at Hayle Generating Station.

Superannuation Scheme. Salary N.J.B. Class "F," Grade 10, £577/£598 plus £68 p.a. at all stages so long as additional system control duties are performed.

Applicants should have previous station control room experience and possess H.N.C. (Elec.) or equivalent. Duties in addition to normal station control include 33 kV and 11 kV distribution system control for Cornwall Sub-Area.

Applications on Form A.E.6/ACT, obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 12 June, 1954. (K 66)

SOUTH EASTERN ELECTRICITY BOARD
FIRST ASSISTANT DISTRICT ENGINEER
Woking District

SALARY £740/£774 p.a. under N.J.B. Class E, Grade 5. Superannuable. Applicants, preferably corporate members of the I.E.E., should have had considerable experience in electricity distribution work covering the planning, construction, operation and maintenance of systems up to 33 kV.

Applications on forms obtainable from J. C. Poole, A.M.I.E.E., Woking Manager, SEEBoard, 4 Chobham Rd, Woking, should be returned by 16 June, 1954.

DEMONSTRATOR (FEMALE)
Swale District

Salary £400 x £20—£480 x £10—£490 p.a. under N.J.C. Grade 1. Superannuable. The person appointed will be required to conduct lectures and demonstrations, advise consumers and generally assist in showrooms. Preference to applicants in possession of recognised diploma or certificate in domestic science and the E.A.W. certificate.

Applications, naming 2 referees to F. E. Fairbank, Swale District Manager, SEEBoard, 88a High St, Sittingbourne, by 16 June, 1954.

A. L. BURNELL,
Secretary.
(K 68)

SENIOR SUPERVISOR (ELECTRICAL)

required for the UGANDA GOVERNMENT PUBLIC WORKS DEPT. for one tour of 30-36 months with prospect of renewal of contract. Salary etc. according to age and experience in scale of £850 rising to £1,215 a year Provident Fund. Outfit allowance £30. Free passages. Liberal leave on full salary. Candidates between 25 and 45 years must have served an electrical engineering apprenticeship and have had wide experience in electrical installation of domestic premises and public buildings. A knowledge of the installation, repair and maintenance of industrial equipment and machinery and of the erection and maintenance of overhead lines up to 11 kV and experience in keeping costs and labour allocation will be an advantage. C. and G. Certificate (Electrical Installation) is desirable. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/29835/EE. (K 45)

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

TRINIDAD and Tobago Electricity Commission requires a SECRETARY. The yearly salary is £1,265 rising by increments of £27. 10s. to £1,347. 10s. When the Commission sells over 100 million units annually the salary will be £1,375, rising by increments of £27. 10s. to £1,457. 10s. A cost of living allowance of £25 and a house allowance—maximum £10. 8s. 4d. per month if married and £6. 5s. per month if single—are also payable. An outfit allowance of £60 will be granted on arrival.

Applicants must have a sound general education, be in possession of a recognised professional qualification and must have had not less than 10 years' experience in the organisation of a large industrial concern preferably in the Electricity Supply Industry. Experience of T.W.I. an additional advantage.

The successful applicant will be provided with First Class passages for himself, his wife and two children up to the age of 18, on appointment. Leave passages to the United Kingdom or equivalent will be provided every three years. Vacation, casual and sick leave on full pay. The successful applicant will be requested to pass a medical examination.

General details of Trinidad's climate, income tax, etc. can be obtained from the West India Committee at 40 Norfolk St, London, W.C.2. Applications giving full details of qualifications, experience and personal particulars, together with two recent references, should be sent by Air Mail to reach the Acting General Manager, Trinidad and Tobago Electricity Commission, P.O. Box 121, Port-of-Spain, Trinidad, B.W.I., on or before 24 July, 1954. (K 65)

BRITISH ELECTRICITY AUTHORITY
North West, Merseyside and N. Wales Division

VACANCY No. 31/54 (Re-issue)—SHIFT CHARGE ENGINEER, Wigan Generating Station. Salary £633/£643 (D.7).

Vacancy No. 82/54—SHIFT CHARGE ENGINEERS (2), Huncoat Generating Station, nr. Accrington. Salary £697/£718 (F.7).

Vacancy No. 83/54—STATION SHIFT CONTROL ENGINEER, Agecroft "B" Generating Station, Agecroft, nr. Manchester. Salary £608/£630 (G.10).

Vacancy No. 84/54—ASSISTANT SHIFT CHARGE ENGINEER, Agecroft "B" Generating Station, Agecroft, nr. Manchester. Salary £641/£667 (G.9).

Vacancy No. 85/54—ASSISTANT SHIFT CHARGE ENGINEER, Stuart St Generating Station, Bradford, Manchester 11. Salary £680/£706 (H.9).

Vacancy No. 86/54—GENERAL ASSISTANT ENGINEER (Control), System Operation Department, British Electricity House. Salary £530/£748 (AX/EX.7).

Vacancy No. 87/54—MAINTENANCE ENGINEER (Elec.), Stuart St Generating Station, Bradford, Manchester 11. Salary £833/£866 (H.6).

Application in writing to Divisional Controller, British Electricity House, 825 Wilmslow Rd, Manchester 20, before 14 June. Quote vacancy No. (K 55)

NORTH WESTERN ELECTRICITY BOARD
APPOINTMENT OF GENERAL ASSISTANT ENGINEER (CHARGE ENGINEER), SUB-AREA MAINS ENGINEER'S DEPARTMENT, MANCHESTER

THE duties will include assisting the Senior Charge Engineer in carrying out the operational control of a large E.H.V. transmission and distribution system, involving the use of supervisory control and system switching. The system inter-connects a number of Power Stations. Applicants must be prepared to perform shift duties. Corporate membership of the Institution of Electrical Engineers will be considered an advantage.

Salary Scale: £705/£731 p.a. Grade M.12. N.J.B. Conditions.

APPOINTMENT OF GENERAL ASSISTANT ENGINEER (TESTING ASSISTANT)—SUB-AREA TESTING STATION, SALFORD

Applicants should be experienced in testing meters, instruments (including standardisation), cables, protection equipment and substation plant and should hold H.N.C. in Electrical Engineering or its equivalent. Experience in a manufacturer's works will be an advantage.

Salary Scale: £661/£681 p.a. Grade M.13. N.J.B. Conditions.

Applications for the above posts to the Sub-Area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, by 12 June, 1954.

APPOINTMENT OF ENGINEERING DRAUGHTSMAN, NORTH WEST FYLDE DISTRICT, FLEETWOOD

Applicants should preferably have experience in the preparation of plans for new and existing buildings, electrical network diagrams and the layout and construction of substations. The possession of a Technical Certificate in Electrical or Mechanical Engineering will be an advantage.

Salary Scale: £433/£567 p.a. Schedule D, Grade 6, N.J.B. Conditions.

Applications to Sub-Area Manager, No. 4 Sub-Area, The North Western Electricity Board, 40/41 Lune St, Preston, by 12 June, 1954.

APPOINTMENT OF THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER, WHITEHAVEN DISTRICT

Applicants must have a good knowledge of estimating and supervising Contract work for Commercial, Industrial and Street Lighting schemes. Experience in agricultural applications would be an added advantage. H.N.C. standard of education is desirable.

Salary Scale: £607/£629 p.a. Grade F.9, N.J.B. Conditions.

Applications to Sub-Area Manager, No. 6 Sub-Area, The North Western Electricity Board, Castle Green, Kendal, by 12 June, 1954. (K 43)

BRITISH ELECTRICITY AUTHORITY
Eastern Division

APPLICATIONS are invited for the following post in the Transmission Department at Divisional Headquarters. in North London:

GENERAL ASSISTANT ENGINEER

Salary Class AX/DX.

Grade 6—£584—£787 per annum plus London Weighting.

Grade 7—£530—£725 per annum plus London Weighting.

Grade 8—£501—£694 per annum plus London Weighting.

The appointments will be within one of the above grades depending upon the experience and qualifications of the successful applicant.

Applicants should preferably hold corporate or graduate membership of the I.E.E. and have experience in the construction or operation and maintenance of high voltage overhead lines, cables and substation equipment.

Forms of application may be obtained from the Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, and returned not later than 19 June, 1954.

W. N. C. CLINCH,
Controller.
(K 70)

KARACHI ELECTRIC SUPPLY CORPORATION

APPLICATIONS are invited for the following posts with The Karachi Electric Supply Corporation Ltd., Karachi, Pakistan, which owns two adjoining oil/gas-fired Steam Power Stations, one 25 (5 x 5) MW and one 30 (2 x 15) MW (under construction—400 psig/775° F, 11·4/66 kV block transformation), also Diesel Power Station (6 MW). Each appointment will be initially for 3 years. Monthly salaries will be paid in Pakistani Rupees per month in the scales stated below. A higher salary than the maximum may be granted in deserving cases (at present £1=Rs. 9/5/-). Employees engaged from overseas will also receive Overseas Allowance stated below. First-class passage forward at commencement and return on termination of agreement and also during leave after 3 years' service will be paid, also for wife and up to three children. Motor Car Allowance will be given to those owning cars. Applications stating age, qualifications, full particulars of experience, posts held and salary drawn during last seven years, and names of three independent referees, should be addressed to the Managing Director (Agents), Karachi Electric Supply Corporation Ltd., Electric House, Elphinstone St, Karachi, Pakistan. Each application will be acknowledged.

(*a*) DEPUTY MANAGER (Generation).—Salary Rs.2,250—100—3,050 per mensem. Overseas Allowance Rs.400 per mensem. Motor Car Allowance Rs.200 per mensem. To take administrative charge of all K.E.S.C. power-generation facilities. Applicant must have had good general and high technical education, preferably be a Corporate Member of a recognised Engineering Institution and have had at least 15/20 years' specialised experience in planning, installation, operation and maintenance of large Steam Power Stations, preferably with oil/gas-fired boilers. The applicant must also have had specialised administrative experience in this field.

(*b*) DEPUTY MANAGER (Transmission and Distribution).—Salary Rs.2,250—100—2,750 per mensem. Overseas Allowance Rs.400 per mensem. Motor Car Allowance Rs.200 per mensem. Applicant must have had good general and high technical education, preferably be a Corporate Member of a recognised Electrical Engineering Institution, and have had at least 15/20 years' experience in planning, estimating, installation, operation and maintenance of 66-kV, 11-kV, 6·6-kV and low voltage cables, overhead lines and substations. The applicant must have also had administrative experience in this field.

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(*c*) PROJECT ENGINEER (Transmission and Distribution).—Salary Rs.1,750—100—2,050 per mensem. Overseas Allowance Rs.300 per mensem. Motor Car Allowance Rs.175 per mensem. Applicant must have good general and technical education and be a Corporate member of a recognised Electrical Engineering Institution and have had at least 10 years' experience in the planning, estimating and erection of 66-kV, 11-kV, 6·6-kv and low voltage cables, overhead lines and substations.

(*d*) DEPUTY MANAGER (Commercial).—Salary Rs.2,250—100—2,750 per mensem. Overseas Allowance Rs.400 per mensem. To take full charge of Commercial Department. Applicant must have had education in Electrical Engineering to degree or diploma standard and must possess approved qualifications and experience of at least 15/20 years in the work connected with tariffs and power supply to industrial consumers.

(*e*) ASSISTANT MANAGER (Accounts).—Salary Rs. 1,750—100—2,050 per mensem. Overseas Allowance Rs.300 per mensem. Applicant must possess approved qualifications in commercial accountancy and must have had at least 10/15 years' experience in responsible posts in this field—preferably with power supply undertakings.

(*f*) ASSISTANT MANAGER (Commercial).—Salary Rs.1,750—100—2,050 per mensem. Overseas Allowance Rs. 300 per mensem. Applicant must have had at least 10/15 years' experience in responsible posts connected with tariffs and power supply to industrial consumers.
(K 24)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the appointment of SUB-AREA ENGINEER to fill a vacancy which will occur in the near future in the Board's predominantly rural No. 4/5 Sub-Area, based on Rhostyllen, near Wrexham, North Wales.

The salary is in accordance with Scale 4 of the salary scales agreed by the National Joint Managerial and Higher Executive Grades Committee, i.e. £1,600 by £50 to £1,750 per annum.

Applicants should have a good general and technical education and be Chartered Electrical Engineers, and have considerable practical knowledge of the design, construction, operation and maintenance of a large distribution system, and the ability to take charge of the staff associated therewith.

The appointment will be superannuable and subject to medical examination.

Applications should be made on forms obtainable from the Board's Establishments Officer, Electricity House, Love Lane, Liverpool 3. Closing date: 22 June, 1954.
(K 85)

MIDLANDS ELECTRICITY BOARD
Shropshire and Herefordshire Sub-Area

APPLICATIONS are invited for the following superannuable posts:

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER, LUDLOW DISTRICT

Applicants should have had a sound technical training with experience in the sale and installation of domestic and commercial equipment and associated wiring. The duties also include advising consumers in respect of new supplies, extensions and alterations on both rural and urban systems. Technical qualifications desirable. Salary £592/£610 (N.J.B. Grade D.8).

SALES REPRESENTATIVE (MALE) KNIGHTON

Applicants should be competent to advise consumers on matters concerning supply tariffs, apparatus sales, wiring and installation thereof. Salary £380/£470 per annum (N.J.C. Grade 1).

Apply, in writing, within 14 days stating age, experience, present position and salary to M. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury. A. Stephens, Secretary. (K 87)

GOVERNMENT OF KUWAIT

ASSISTANT SHIFT ENGINEER required for service with the Government of Kuwait, Persian Gulf. His services are required for a new Steam Power Station and a Water Distillation Plant. He will be required to work on shift under the Shift Charge Engineers. No applicant will be considered unless he has had shift operating experience with boiler and turbo alternator plant as well as control room experience. The starting consolidated salary offered is at the rate of £1,500 per annum. Free furnished quarters and free medical attention are provided. The first year will be probationary and subject to satisfactory service, this contract may be extended by another two years. Married accommodation cannot be promised under one year. Applications in the first instance, stating qualifications, training and experience, should be addressed to the Personnel Officer, Ewbank and Partners Limited, Engineering Consultants, 10/11 Grosvenor Place, London, S.W.1.
(K 71)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

ASSISTANT CHEMIST (Fuel) is required in the Divisional Laboratory at Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule "C," Grade 5, of the Agreement, commencing in the range £649/£790, and ultimately rising to £858 per annum.

Applicants should hold a university degree in Chemistry or other equivalent qualification, and should have a sound knowledge and experience in fuel sampling analysis, and problems appertaining to combustion. Power Station experience will be an advantage.

Apply, quoting Vacancy No. 678MD on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 19 June, 1954.
(K 84)

BRITISH ELECTRICITY AUTHORITY
South Wales Division

APPLICATIONS are invited for the following superannuable N.J.B. appointments:

DIVISIONAL HEADQUARTERS

Vacancy No. 54

THIRD ASSISTANT ENGINEER (Metering), Technical Department. Salary AX/CX.5. £649/£835 per annum.

Electrical Engineering Degree or H.N.C. Duties will include the standardisation of precision indicating instruments, testing and commissioning of large power metering units and associated equipment, together with compiling of technical reports and records.

USKMOUTH AND TIR JOHN POWER STATIONS

Vacancy No. 58

ASSISTANT SHIFT CHARGE ENGINEER. Salary K.9 £766/£796 and H.9 £680/£706 per annum respectively.

H.N.C. and regular apprenticeship desirable. Operating experience in a modern generating station essential.

USKMOUTH POWER STATION

Vacancy No. 59

1. OPERATION AND EFFICIENCY ENGINEER. Salary Class K, Grade 5, £1,003/£1,047 per annum.

Engineering degree and/or Corporation Membership of either the Institution of Mechanical or Electrical Engineers desirable. Responsible to Station Superintendent for maintenance of efficient operation and for carrying out plant tests and special investigations.

2. ASSISTANT MAINTENANCE ENGINEER (Mechanical). Salary Class K, Grade 9, £766/£796 per annum.

H.N.C. and previous maintenance experience essential.

Application forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 21 June, 1954. (K 93)

BRITISH ELECTRICITY AUTHORITY
London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

JUNIOR ENGINEER—ST. PANCRAS GENERATING STATION

Vacancy No. 54/407

Generating Station experience an advantage. Good opportunity for gaining further experience. Salary—Class E, Grade 14=£470 p.a.

JUNIOR ENGINEER—TAYLORS LANE GENERATING STATION

Vacancy No. 54/408

Experience of Generating Station operation an advantage. Duties will be combined Technical and Operational. Salary—Class F, Grade 14=£491 p.a.

JUNIOR ENGINEER—WEST HAM GENERATING STATION

Vacancy No. 54/409

Control Room shift duties (assistance). Salary—Class H, Grade 14=£541. 16s. p.a.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, British Electricity Authority, London Division, Generation House, Great Portland St, W.1, and be received within 14 days of this advertisement. (K 69)

THE SOUTH WEST SCOTLAND ELECTRICITY BOARD
Glasgow Sub-Area

APPOINTMENT OF ENGINEERING DRAUGHTSMAN

APPLICATIONS are invited for the position of Engineering Draughtsman in the Glasgow Sub-Area.

Applicants should have had a wide experience in the preparation of working drawings for general building construction. Experience in rough estimating and in detailing of reinforced concrete and structural steelwork would be an advantage.

Salary and conditions will be in accordance with the Agreement of the National Joint Board for the Electricity Supply Industry. The salary will be on Schedule "D," Grade 6, of that Agreement, viz. £477/£567 per annum, the point of entry being dependant on experience. The appointment will be superannuable.

Application forms which may be obtained from the undersigned should be returned not later than 19 June, 1954.

A. KELSO,
Sub-Area Manager.

75 Waterloo St,
Glasgow C.2. (K 81)

INSTALLATION SUPERINTENDENT

required by SIERRA LEONE GOVERNMENT ELECTRICITY DEPT. for 2 tours each of 18 to 24 months either (1) with prospect of pensionable employment at salary, etc., according to experience in scale £742 rising to £1,177 a year, or (2) on temporary terms at salary, etc., according to experience in scale £789 rising to £1,272 a year with gratuity of up to £150 a year. Outfit allowance £60. Free passages for officer, wife and up to two children up to the age of 10 or grant up to £150 a year for maintenance in U.K. Liberal leave on full salary. Candidates must have served an apprenticeship in the maintenance section of a large works or in the consumers section of an electricity undertaking and should possess an O.N.C. or appropriate C. and G. Certificates. They should have experience in the maintenance of motors and associated control gear up to 100 h.p., installation of power and lighting circuits to comply with I.E.E. regs., and testing of single-phase meters. Experience in the maintenance of domestic electrical equipment an advantage. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/28555/EE. (K 44)

CITY OF SALISBURY SOUTHERN RHODESIA

VACANCY FOR TECHNICAL ASSISTANT, GRADE 2

APPLICATIONS are invited for the post of Technical Assistant, Grade 2 (Test Room Assistant), on the salary grade £900 x £50—£1,150 in the Test Section of the Electricity Department.

Candidates should have a sound knowledge of, and be able to carry out, tests on all types of protection on H.T. and L.T. switchgear on site and in the Test Room, and they should have had experience or General Test Room work, and on instruments and relays.

The appointment will be subject to Council's Service and Leave Regulations, and any amendments thereto. The salary payable will commence at the minimum of the scale, and rise by annual increments to the maximum; no cost of living or other allowances are payable.

The successful applicant must be able to comply with the requirements of the Rhodesian Immigration Authorities, and will be required to submit a satisfactory medical certificate of fitness.

Applicants are requested to submit full particulars of their qualifications, training and experience, giving full details of positions held, marital state, age, place of birth, and nationality. Copies of not more than three recent testimonials may be included.

Canvassing directly or indirectly will be a disqualification.

Applications, suitably endorsed on the cover, must reach the offices of the undersigned on or before Saturday, 19 June, 1954.

Airmail paper should be used.

Davis and Soper Ltd.,
52 and 54 St. Mary Axe,
London, E.C.3.

18 May, 1954. (K 32)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

SECOND ASSISTANT STATION CHEMIST is required at Meaford Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule "A," Grade G11, of the Agreement, £573/£596 per annum.

Applicants should possess Higher National Certificate in Chemistry or have reached an equivalent standard for another qualification. Experience in power station chemistry, including the analysis of water, fuel, and oil is desirable, but consideration will be given to applicants with industrial laboratory experience.

Apply quoting Vacancy No. 657MD on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 19 June, 1954. (K 83)

MINISTRY OF LABOUR AND NATIONAL SERVICE

ELECTRICAL INSPECTOR OF FACTORIES

THE Civil Service Commissioners invite applications for this pensionable post. Age at least 35 on 1 Jan., 1954. The duties involve a sound knowledge of the general scheme and conditions of electric supply in this country and of the products of electrical manufacturers. Electrical Inspectors administer the Electricity (Factories Act) Special Regulations, 1908 and 1944 in factories, taking account of any special conditions which obtain, and notifying occupiers of contraventions.

Candidates must be Corporate members of the Institution of Electrical Engineers with several years' professional experience. Responsible experience in large electricity supply undertakings or electrical manufacturing works an advantage.

Salary scale (London), including Extra Duty Allowance, where payable, £1,166/£1,575 (men); £1,042/£1,400 (women). Somewhat lower outside London. Minimum linked to age 37 with deductions of £40 (men) and £35 (women) for each year down to age 35.

Further particulars and application forms from Civil Service Commission, Scientific Branch, 30 Old Burlington St, London, W.1, quoting No. S4336/54. Application forms to be returned by 19 June, 1954. (K 80)

LONDON ELECTRICITY BOARD

SENIOR DRAUGHTSMAN

APPLICATIONS are invited for the above position in the Design and Planning Branch of the Northern Sub-Area at Aldersgate, London, E.C.1.

Applicants should have had training and experience in building construction and the design of steelwork and reinforced concrete structures, and be capable of preparing drawings and making calculations for the alteration of existing premises and the conversion of basements into substations and transformer chambers. Experience in the lay-out of electrical equipment up to 11 kV, whilst not essential, would be an advantage.

The post is graded under Schedule "D" of the National Joint Board agreement as Grade 5, £595. 7s. to £704. 11s. per annum, inclusive of London Allowance.

Application forms obtainable from Personnel Officer, 46 New Broad St, E.C.2, to be returned completed within fourteen days of the publication of this advertisement. Please enclose addressed envelope and quote ref.: V/1692/T. on all correspondence. (K 100)

BRITISH ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

Vacancy No. 81/54/ET
JUNIOR ENGINEER
NORTH WILFORD POWER STATION

A suitable candidate will be given the opportunity to obtain operating and maintenance experience in the various sections of this large Generating Station operating at 850° F/600 lb sq ins. steam conditions. The initial salary will be £545 per annum within Class K, Grade 15, of the National Joint Board Agreement.

Preference will be given to the candidates who hold the Higher National Certificate or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Closing date for receipt of applications will be 15 June, 1954.

Vacancy No. 80/54/ET
SECOND ASSISTANT STATION CHEMIST
FREEMAN'S GENERATING STATION
LEICESTER

Experience of analyses of fuel, water and oils is desirable and educational standard up to Higher National Certificate would be an advantage.

Salary in accordance with Class H, Grade 11 (£607/£628 per annum), of the National Joint Board Agreement.

Closing date for receipt of applications will be 15 June, 1954.

The above positions will be pensionable within the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box No. 25, British Electricity House, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.
(K 86)

SOUTH-EAST ESSEX TECHNICAL COLLEGE
Longbridge Road, Dagenham

REQUIRED September: ASSISTANT GRADE B for Electrical Subjects to O.N.C. level with some electrical installation work for City and Guilds Courses. Experience with High Voltage Equipment an advantage. Salary (under review): £490 x £25—£765 (man), plus degree (or equivalent) and training additions, and increments for previous recognised experience.

Further details and form from Clerk to Governors (S.A.E.). (K 90)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2.

BRITISH ELECTRICITY AUTHORITY
Southern Division

APPLICATIONS are invited for a post as:
SECOND ASSISTANT STATION CHEMIST
Southampton Generating Station

Applicants should have had practical experience of fuel, water and oil testing appropriate to a modern generating station, and a knowledge of boiler chemistry for high steam pressures and temperatures will be an advantage. Preference will be given to candidates with H.N.C. in chemistry or equivalent qualifications.

Salary N.J.B. Class F, Grade 11, £548/£565.

Special application forms obtainable from P. D. A. Oliver, Divisional Secretary, 111 High St, Portsmouth, should be returnable by 21 June, 1954. (K 88)

SOUTH EAST SCOTLAND ELECTRICITY BOARD

JOINTER E.H.T. wanted for Berwick District, Southern Sub-Area. N.J.I.C. Conditions. Present rate of pay 45 pence per hour. Successful applicant would require to reside in Berwick upon Tweed, where a Council house may be available. Applications stating age, whether married or single, and giving details of training and experience should reach the Sub-Area Manager, South East Scotland Electricity Board, High St, Galashiels, within 14 days. (K 62)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

DEMONSTRATOR (Female) required in the North Wirral District to operate from Wallasey. Salary within the range £400/£490 p.a. (N.J.C. Grade 1). Appointment superannuable and subject to medical examination.

Applicants should hold a diploma in Domestic Science or other approved certificate. Previous service in the Electricity Supply Industry an advantage.

Applications, on forms obtainable on written request from the Manager, No. 3 Sub-Area, Electricity House, Newgate St, Chester, must be returned not later than 10 June, 1954. (K 54)

ALKALINE BATTERIES LTD., of Redditch, are the largest makers in the Empire of Alkaline accumulators, miners' lamps and emergency lighting systems, which are in rapidly growing use particularly for export. The company has vacancies in its Technical Sales and Development Sections for Graduate ELECTRICAL ENGINEERS, not over 30 years of age, or for men nearing the end of their Degree Course who have completed National Service. The posts are pensionable and offer the prospect of executive rank. Applications with full educational details and experience should be addressed to Commercial Manager, Alkaline Batteries Ltd., Union St, Redditch. (K 23)

A TECHNICAL ASSISTANT in light engineering is required by The General Electric Co., Ltd., at the Head Office of their Sales Organisation. Applicants in the age group 23/26 years should have obtained the O.N.C. and have had previous experience in the preparation of tenders for switchgear, also the layout of smaller type switchboards (800 amps). The position offers scope for advancement and carries a good commencing salary. Apply in writing giving full details of previous training and experience, quoting reference "M.X. and Y." to the Staff Manager, Magnet House, Kingsway, W.C.2. (K 48)

ASSISTANT CHEMIST required by the Electricity Corporation of Nigeria; preferably B.SC. with Power Station experience. Salary £760 by £40 to £1,000 plus Expatriation Allowance. Application Form and Conditions of Service from the Liaison Officer, Electricity Corporation of Nigeria, 11 Manchester Sq, London, W.1. (K 76)

BRITISH Engine Boiler and Electrical Insurance Company Ltd., 24 Fennel St, Manchester 4. The Company requires additional ELECTRICAL PLANT INSPECTORS in various districts in England and also in Edinburgh and Dublin. Permanent positions carrying progressive salary scale £540 to £785 and non-contributory pension. Candidates age 26 to 30 years with apprenticeship in the manufacture or repair of electrical machinery and preferably with subsequent experience of industrial use of electrical machinery, and who have gained the Higher National Certificate in Electrical Engineering or are Graduates of the Institution of Electrical Engineers are invited to apply in own handwriting stating age, qualifications and experience. (K 40)

COUNTER ASSISTANT, wholesale trade, references essential. Half-day closing Sat. Summer Holiday. Thames Electric Co., 9/11 St. James Rd, Kingston. (K 101)

CONTRACTS ENGINEERS required for handling of Switchgear tenders and contracts. Applications should state age, experience, qualifications and salary required and should be addressed to Personnel Manager, South Wales Switchgear Ltd., Blackwood, Mon. (K 36)

DESIGN ENGINEER. An exceptional opportunity exists in South East London, for a Design Engineer with sound theoretical knowledge and recent industrial experience in the design of A.C. and D.C. machines and low voltage control gear. The appointment offers, to the right man, rapid advancement to a position of superior technical and administrative responsibility. The salary will be commensurate with the requirements. Reply giving age and full details of training and experience to Box 2V F7587, A.K. Advg., 212a Shaftesbury Ave, London, W.C.2. (K 111)

DRAUGHTSMAN to take charge of Drawing Office of well-known Scottish Electrical Contractors. Experience of overhead line practice preferred but not essential. State age, experience and salary required.—Box No. 3579, Electrical Times. (K 97)

DRAUGHTSMEN / DESIGNERS required by manufacturers of medium switchgear and associated equipment. Factory located in pleasant town N.W. England; assistance re accommodation on favourable terms. Good starting salary and prospects. Write giving particulars of age, training and experience to Box 2JF. 6854. A.K. Advg., 212a Shaftesbury Ave, London, W.C.2. (K 78)

ELECTRICAL DRAUGHTSMEN for design of lighting, power and instrument installations for chemical and oil refinery plants. Applicants should be experienced in the preparation of bills of material from design drawings. Salaries above average, five-day week, generous staff pension scheme. Write stating age, experience, and qualifications to Head Wrightson Processes Ltd., 24 Baltic St, London, E.C.1. (K 22)

EXPERIENCED and qualified TECHNICAL ASSISTANT (Electrical) required by Harlow Development Corporation. Salary £650 x £25 to £750 per annum.

Experience in heating and ventilating added advantage.

Superannuation, housing; detailed applications with names of two referees to General Manager, "Terlings," Gilston, Harlow, Essex, by 14 June, 1954. (K 47)

ELECTRICAL ENGINEER, B.SC. standard or equivalent required by Sheffield Company. Age about 27 years. Knowledge of E.H.T. Switchgear and practical experience in industry an advantage. Permanent and progressive position. Applications with full particulars to—Box No. 3575, Electrical Times. (K 74)

Transformers (Watford) Limited.
wish to make a Senior Sales appointment.

Applicants should be well known in the industry and have held a responsible position in a similar capacity.

Excellent prospects and remuneration.

Apply in confidence to Managing Director, Transformers (Watford) Limited, Sandown Road, Watford, Herts. (K 99p)

EWBANK and Partners have vacancies for the following: MECHANICAL ENGINEERING DRAUGHTSMEN experienced in power station design and layout, pipework layout, circulating water systems, and with some knowledge of coal and ash handling plants.

ELECTRICAL ENGINEERING DRAUGHTSMEN experienced in power station and substation distribution systems.

The positions are permanent and are pensionable. Free lunches are provided and a five-day week is in operation. Applicants should write in the first instance, stating age, details of experience and salary required to the Personnel Officer, Ewbank and Partners, Engineering Consultants, 10/11 Grosvenor Place, London, S.W.1. (K 28)

ELECTRICAL ENGINEER required, age 30-35, with initiative and experience of the installation and maintenance of machines and distribution systems in large factories. Applicants should have served a recognised apprenticeship and be capable of negotiating contracts with equipment manufacturers. Salary in accordance with qualifications and experience. Profit Sharing Scheme. Pension Fund. Canteen facilities. Apply, with details of education and experience in chronological order, to: The Chief Engineer, The Associated Portland Cement Manufacturers Ltd., Portland House, Tothill St, London, S.W.1. (K 33)

ELECTRICIAN for large British Engineering firm in the Sudan. Good practical experience capable initially of supervising unskilled native labour in the field in erection of cables, overhead transmission lines, internal house wiring, etc., and of developing into full Electrical Engineer; excellent prospects for keen progressive man. Age 24/28, must be unmarried and physically fit. Commencing salary £E.948 with annual £E.48 increments plus furnished quarters. Provident Scheme, good leave with free passages. There is no Income Tax in Sudan at present. Good references essential. Apply with copy references and full particulars to—Box No. 3571, Electrical Times. (K 50)

GENERAL MANAGER required for a large factory producing electric domestic appliances, consisting of cookers, water heaters and space heating equipment. Applications in writing, which will be treated in confidence, to—Box No. 3581, Electrical Times—stating experience, age and salary suggested. Good salary and pension arrangements for right type of man. (K 98)

LINESMAN-ERECTORS for steel tower overhead transmission lines required. 3s. 11½d. per hour for fully experienced men. 7s. per day out allowance. Only men with previous experience of this work need apply to Labour Officer, 30 Leicester Square, London, W.C.2, marking envelope "Linesman-Erector." (K 95)

MAINTENANCE ELECTRICIANS required for large Paper Mill. Sound experience of large A.C. and D.C. motors and switchgear essential. Bowater's Thames Paper Mills Limited, Northfleet, Gravesend, Kent. (K 37)

MAINTENANCE ENGINEER with thorough lift and all-round experience. Full details of experience, age and salary required to—Box No. 3585, Electrical Times. (K 105)

GYROSCOPES & SIMILAR PRECISION DEVICES

AN interesting vacancy has arisen for a SENIOR ENGINEER to take charge of and build up a development section in this field with The English Electric Company, Ltd., Luton. Essential requirements are experience in the design and engineering of precision mechanical equipment. Engineers interested are invited to write to Ref. 1326, Dept. C.P.S., 336/7 Strand, W.C.2, for an appointment either in their locality or in London, whichever is preferred. (K 77p)

REPRESENTATIVE required by well-known "Non-Ring" Cable Manufacturer to cover Scotland. Applicants must have contacts with Area Boards, National Coal Board and Industrial organisations, etc. Reply stating full details experience and salary required—Box No. 3583, Electrical Times. (K 104)

REPRESENTATIVE to cover S.E. Scotland Electricity Board and N. of Scotland Hydro-Electric Board areas. Applicants should be resident on the territory, have good contacts with architects, wholesalers and contractors, and possess their own car. This is an interesting and worthwhile post for a man with right background. Write in confidence to—The Sales Manager, M.K. Electric Limited, Wakefield St, London, N.18. (K 63)

REPRESENTATIVE required by well established manufacturers of high grade switches to cover Northern Counties. Contact with Area Boards and leading industrial organisations an advantage and one of two other agencies in electrical line not objected to. Reply giving full details including experience and remuneration expected to—Box No. 3559, Electrical Times. (K 34)

SALES ENGINEERS having initiative and enthusiasm wanted. Well-known Company manufacturing motors, transformers, etc., has vacancies in Midlands for both Senior and Junior positions. Confidential.—Box No. 3553, Electrical Times. (K 30)

SENIOR ELECTRICAL DRAUGHTSMAN required for research and development work at Havering, Romford. Sound experience in power wiring and layouts essential. Application in writing, giving full personal details to Ilford Limited, Romford, Essex. (K 96)

TECHNICAL REPRESENTATIVE required by a large firm of Manufacturing Electrical Engineers having connection with Architects and Consulting Engineers. Write with full details including experience, age and salary required, to Box No. 7705, c/o Charles Barker and Sons Ltd., 31 Budge Row, London, E.C.4. (K 94)

TRANSFORMER DESIGN ENGINEER required for work on power transformers, preferably with University Degree or H.N.C. in Electrical Engineering. Apply stating age, experience and salary required, to Denis Ferranti Co., Ltd., Rhos Mill, Royton, Oldham, Lancs. (K 29)

THE Telegraph Construction and Maintenance Co., Ltd., Cable manufacturers, require a Qualified ELECTRICAL ENGINEER to work on the design of cable fittings. The work involves the development of fittings for polythene insulated high voltage cables. Practical experience of cable accessories desirable. This post is pensionable and carries a salary of £550/£600 upwards according to qualifications and experience. Write details to Staff Officer, Telcon Works, Greenwich, S.E.10, quoting reference RG/2. (K 61)

THE Telegraph Construction and Maintenance Co., Ltd., Cable manufacturers, wish to appoint a TECHNICAL ASSISTANT to be concerned primarily with the design of all types of cables. Candidates must have some previous experience of manufacture of cables, and experience of cable estimating would be a distinct advantage. Inter-B.Sc. or at least National Certificate in Electrical Engineering. Commencing salary £550 upwards according to qualifications and experience. Pension scheme, five-day week and all welfare facilities. Write details quoting reference CD/5 to: Staff Officer, Telcon Works, Greenwich, S.E.10. (K 60)

THE Telegraph Construction and Maintenance Co., Ltd., Cable manufacturers, require an ESTIMATOR. Experience of cable estimating preferred, but applicants with sound knowledge of cable manufacturing methods would be carefully considered. Must have completed National Service. Educational standard: G.C.E. (ordinary level) would be an advantage. Pension scheme, five-day week and all welfare facilities. Salary in accordance with qualifications and experience. Write details quoting reference CD/3 to: Staff Officer, Telcon Works, Greenwich, S.E.10. (K 59)

TECHNICAL REPRESENTATIVE required for South East England by the leading firm of High Pressure Valve and associated equipment manufacturers. Applicants should be between 25 and 35 years of age and must have sound technical and practical training in steam engineering. Some experience of Power Station practice would be helpful. An engineering diploma is preferable but not essential. The post offered carries excellent prospects. Write giving full details of general education, technical attainments and experience to—Box No. 3573, Electrical Times. (K 51)

TECHNICAL ASSISTANT required for small firm of electrical heating manufacturers in Woodford.

Applicants should have the Ordinary National Certificate in Electrical Engineering and should preferably have completed their National Service.

Write, giving full particulars of experience, qualifications, present salary and earliest starting date to—Box No. 3569, Electrical Times. (K 49)

TECHNICAL ASSISTANT required for Export Sales Department of West London Instrument Manufacturers. Higher National Certificate standard. Some knowledge of foreign languages preferable but not essential. Write giving particulars of education, experience and salary required.—Box No. 3577, Electrical Times. (K 75)

TRANSFORMER TESTER required for routine testing of all types and sizes up to 1,000 kVA, 22 kV. Preferably with full experience but consideration will be given to man with theoretical knowledge only wishing to acquire experience. Please write stating education and experience to the Nelson Engineering Co., Ltd., Netherfield Road, Nelson, Lancs. (K 73)

WANTED for service in Northern Nigeria, West Africa, an experienced ARMATURE WINDER, capable of completely rewinding D.C. Armatures and A.C. Stators and Rotors up to 300 h.p. also 3-phase Transformers. Must have served apprenticeship as Armature Winder and had subsequent experience as Journeyman Winder. Man of under 35 with experience of handling labour preferred. Tours are for 2 years with 4 months leave on completion. Housing, light, fuel and equipment provided. Salary £55 per month plus cost of living allowance at present £16 per month for single man or £15 if married. Provident Fund and Non-contributory Pension Scheme. Apply by letter stating experience to A.O. Nigeria Limited, 55-61 Moorgate, London, E.C.2. (K 102)

WANTED

12 and 15 h.p., 3-ph., 400 V, A.C., 50 c., 900/1,200 r.p.m. Motors wanted. Green Bros. (Electrical) Ltd., Brackley, Northants. (K 38)

SURPLUS Electrical Stocks bought for cash.—Box No. 3567, Electrical Times. (K 39)

WANTED, D.C. and A.C. ball-bearing MOTORS, motor generator sets, dynamos and alternators.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London, N.1. (K 3)

WANTED. ROTARY CONVERTERS, any size.—Universal, 221 City Rd, London, E.C.1. (K 4)

WANTED, for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady St, Bethnal Green, E.1. (K 1)

WANTED WASTE MERCURY 12s. 6d. lb or more delivered depending on quantity, also Electrical Contacts, magneto points, etc. Keenest prices for all non-ferrous and precious scrap metals in any form. Cash on collection by arrangement. Belgrave Buyers (E.T.), 5 Belgrave Gardens, London, N.W.8. MAI 7513. (K 27)

APPOINTMENTS WANTED

ELECTRICAL ENGINEER with Consulting Engineering experience seeks appointments. Inspections, Reports and recommendations, site supervision, etc. Fees reasonable.—Box No. 3563, Electrical Times. (K 35)

REPRESENTATIVE seeks to represent a firm for electrical accessories and appliances in the East of Scotland area.—Box No. 3587, Electrical Times. (K 110)

WORK WANTED

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (K 10)

ARMATURE REWINDING service to the trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum cleaner and drill armatures replaced from stock 24-hour service. Every job guaranteed. All vacuum cleaner parts, hoses, etc., in stock for any make. Apex washer agitator shafts stocked.—Regam Electric Cleaner Service, 95 Park Lane, Leeds 1. (K 15)

FISHER FOUNDRIES LTD., Greet, Birmingham 11, for Machine Moulded Precision Castings in gun metal and soft grey iron. Tel.: Victoria 0197. (K 18)

WORK WANTED. Capacity available for all types of COIL WINDING.—Box No. 2425, Electrical Times. (K 13)

FOR SALE

A.C. and D.C. MOTORS, GENERATORS from stock.—Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5566-9. (K 6)

A HIGH VACUUM IMPREGNATION UNIT or single or batch coil impregnation service to R.I.C. Specification 214 or individual requirements. — Blickvac, 505 Lordship Lane, S.E.22. Tel: Forest Hill 7089. (K 14)

A.C. and D.C. MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works Ltd., Milo Rd, East Dulwich, S.E.22 (Forest Hill 2278-9). (K 2)

A.A. ELECTRICAL CO. for A.C.-D.C. MOTORS, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—Chi. 5105, 67 Rothschild Rd, W.4. (K 5)

FLAMEPROOF MOTORS, M.G. SETS, D.C. MOTORS, GEARED MOTORS, A.C. MOTORS, TRANSFORMERS, CONTROL GEAR. SPECIALS. FLANGE MOTORS

ELECTROPOWER COMPANY LIMITED

Kingsbury Works, Kingsbury Rd, London, N.W.9

Tel.: COLindale 4621/3,

Grams: Lectropowa, Hyde, London (K9p)

DON'T forget reconditioned METERS are supplied by The Electric Meter Company, Dept ET46, Castle Circus House, Torquay. (K 109)

DON'T worry about your electricity bills. Fit 1s. slot electric meters for hotels, bed-sitters, etc. Prices from 50s.—Selectrics, Department E.T., Castle Circus House, Torquay. Tel. 7218. Trade inquiries invited. Trade discount. (K 16)

FOR Disposal. GENERATING SETS (2). Each comprising one 720 h.p. Triple Compound Condensing Engine by Belliss and Morcom, suitable for a working pressure of 140 p.s.i.g., with an overload rating 15%/10% for 2 hours, direct coupled to a 625 kVA (·8 P.F.) salient pole alternator, 440 V, 3-phase, 25 cycles, 250 r.p.m. by Bruce Peebles. Also direct coupled 21 kW, D.C. exciter, 110 V, 150 amps.

CONDENSING PLANT (1). For operation with the above Generating Sets, comprising: 1 Korting Jet Condenser, and 1 Centrifugal Circulating Water Pump, having a capacity of 600 g.p.m., and a head of 18 ft, direct coupled to a 12 h.p., 715 p.p.m., 440 V, 3-phase, 25 cycles, squirrel cage Siemens open type induction motor.

Apply: Scottish Oils Limited, Middleton Hall, Uphall, Broxburn, West Lothian. For the attention of Mr. Stirling. Broxburn 34. (K 53)

FLUORESCENT BALLASTS—wide range —20 W, 30 W, 40 W, 80 W. Normal and high power factor. Built for long and dependable life—Optimum Performance—Quiet operation. Fully impregnated—Progressive compounding—Heavy encased housing—Quick deliveries. Data on request. Micramatic Ltd., Bournemouth, Hants. (K 20)

GRUBB IMMERSION HEATERS by return of post to your address. Let us send you our latest list and trade terms of these quality products. John Owner and Co., Ltd., Springfield Rd, Birmingham 13. Tel. SPRingfield 2939. (K 25)

HOUSE SERVICE METERS. The Electric Meter Company, Dept. ET46, Castle Circus House, Torquay. (K 108)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Rd, London, E.C.1. (K 7)

METERS reconditioned, all types, AC/DC, quarterly credit single and three-phase 3/4 wire 2½/100 amp. Prepayment, single dual and triple coin, fixed or variable tariff 2½/50 amp. Delivery ex-stock, guaranteed, free catalogue lists 200 types. Trade Discount 33⅓%. The Electric Meter Company, Dept. ET46, Castle Circus House, Torquay. Telephone 7963. (K 107)

MERCURY SWITCHES are made by Hall, Drysdale and Co., Ltd., of 58 Commerce Rd, Wood Green, London, N.22. Tel.: BOW. 7221. (K 8)

PURLEY CHOKES AND BALLASTS. Our 80-W tapped h.p.f. ballast with starter switchgear-holder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject.—F. W. Blanshard Ltd. (Dept. E.T.), Purley, Surrey. Uplands 4818-9. (K 11)

SLIP-RING MOTORS, 3 h.p., 460 r.p.m., Crompton 10 h.p., 1,425 r.p.m., with Starters 400/3/50. Several Tubular Heaters 10 ft/12 ft long. Quantity Distribution Boards. Switch fuses, etc. A. H. Kimmins and Sons Ltd., Lyndhurst Rd, Worthing. (K 52)

TIME SWITCHES for sale. Reconditioned or new. 12 months' guarantee. Immediate delivery. List from: J. W. Hughes, 3 St. Thomas' St, London Bridge, S.E.1. (Tel.: HOP 2759.) (K 21)

168 H.P. "PETTER" ATOMIC DIESEL ENGINE for sale, 3 cyl. vertical, 2 stroke 410 r.p.m. Complete power plant with all starting and cooling equipment and fuel storage tank. Photo, F. J. Edwards Ltd., 359 Euston Rd, London. (K 106)

VERY large quantity of L.C.T. Electrical spares; ELECTRIC MOTORS, Allichaleners, Axial Flow Fans, Reliance Cleveland Fire Bilge Pumps, Worthington Bilge Pumps, Cutler Hammers, inc. Milwaukee armatures for motor barge pumps, switchboard generators, and other types of electrical spares; also quantities of steering gear, etc. All above spares are American origin and new. Phone WES 8837 and 6489. (K 79)

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CITY AND GUILDS (Electrical, etc.) on "No Pass—No Fee" terms. Over 95 per cent successes.—For full details of modern courses in all branches of Electrical Technology send for our 144-page handbook FREE and post free.—B.I.E.T. (Dept. 39), 29 Wright's Lane, London, W.8. (K 12)

FREE! Brochure giving details of courses in Electrical Engineering and Electronics covering A.M.Bri.I.R.E., City and Guilds, etc. Train with the postal Training College operated by an Industrial Organisation. Moderate fees. E.M.I. Institutes, Postal Division, Dept. ET29, 43 Grove Park Rd, London, W.4. (K 17)

AGENCIES

BESCOL Electric Ltd., Birmingham 8, manufacturers of Domestic Electrical Appliances, require AGENTS for the South and South Eastern, Midlands, North and South Wales, and Yorkshire, excluding North Riding, areas of England. (K 26)

IRELAND. Opportunity for live AGENTS in North and South. Wanted by leading Manufacturer of motors, transformers, rectifiers, switchgear, etc. Interviewing in Ireland mid-June. Full particulars to—Box No. 3555, Electrical Times. (K 31)

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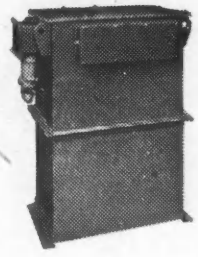

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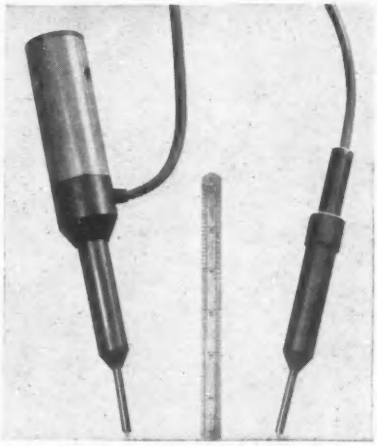
MEDIUM VOLTAGE ALL INSULATED

TEST LAMP

100 to 500 volts—A.C. or D.C.



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Comprises a 250 v., 15 w. pigmy lamp, wired in series with a resistance. Can be easily carried in the pocket.

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23 LOCHBURN ROAD, MARYHILL, GLASGOW N. W.

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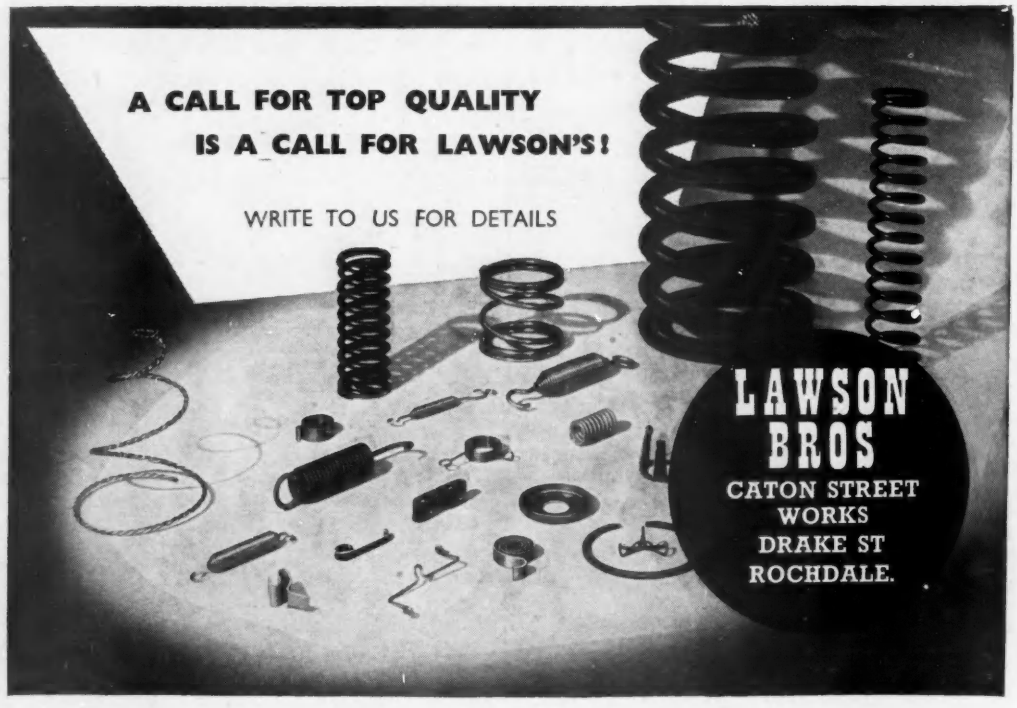

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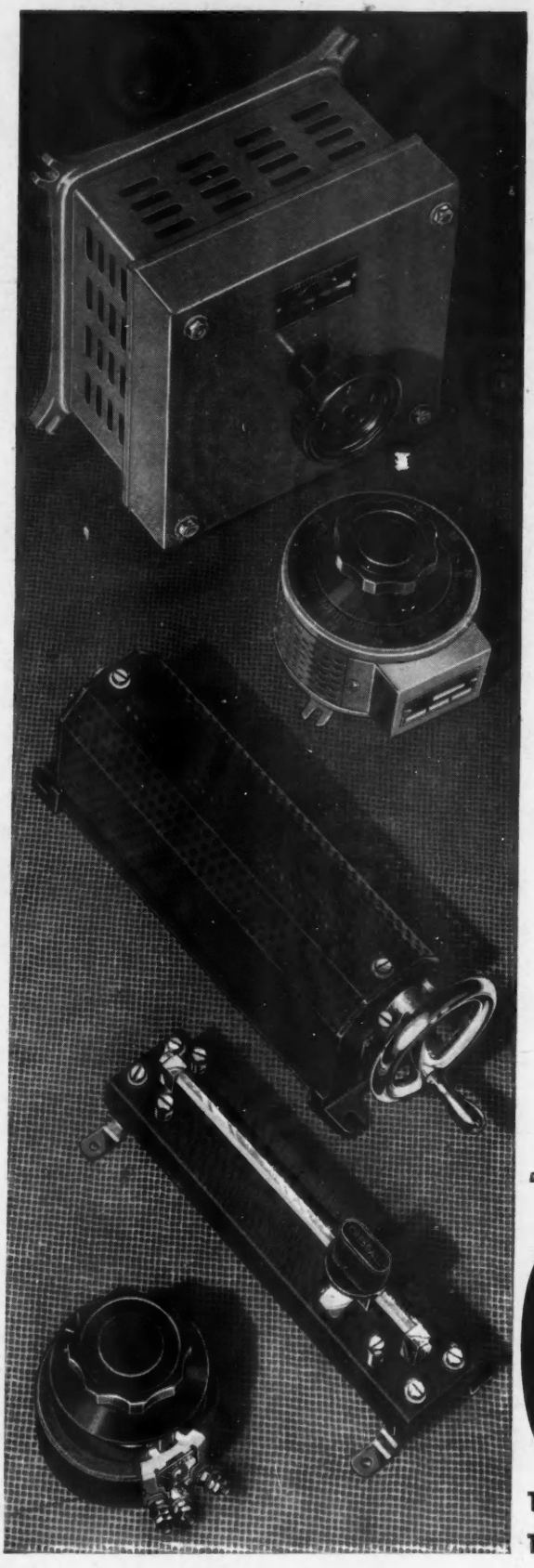

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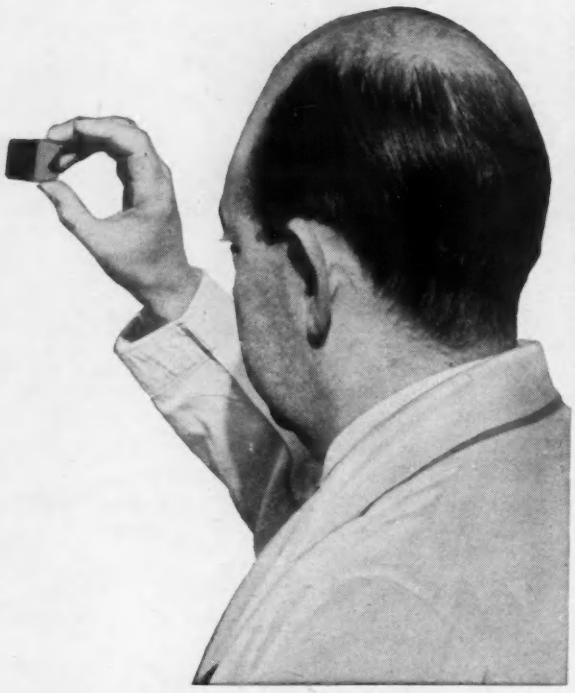

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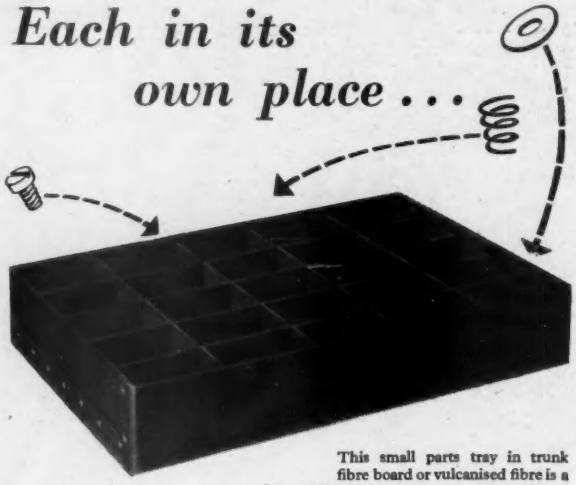

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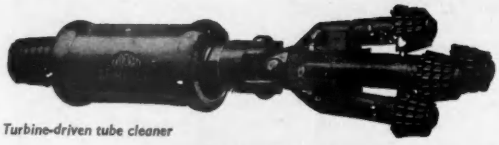

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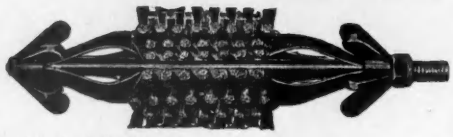

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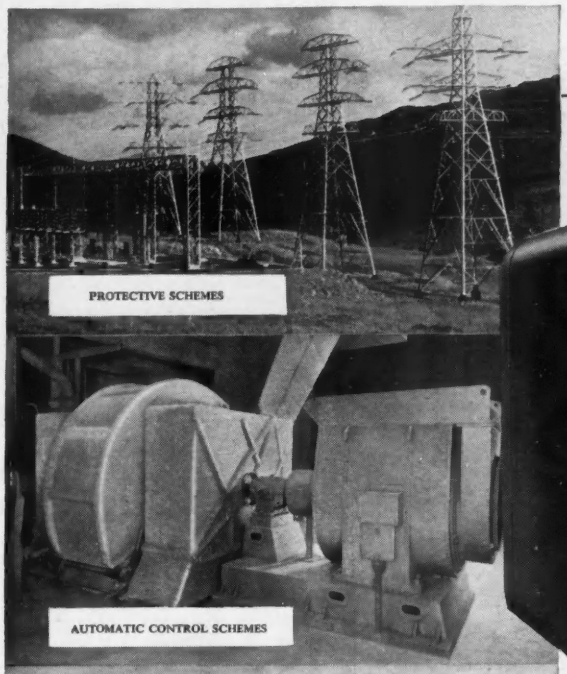

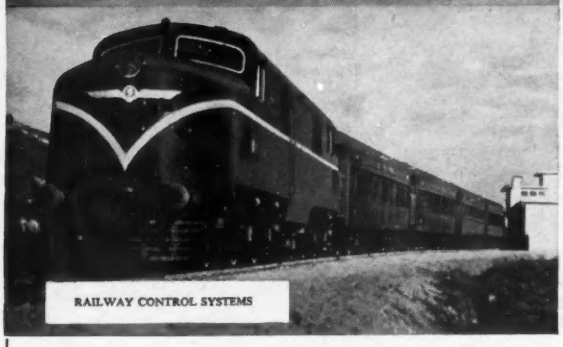

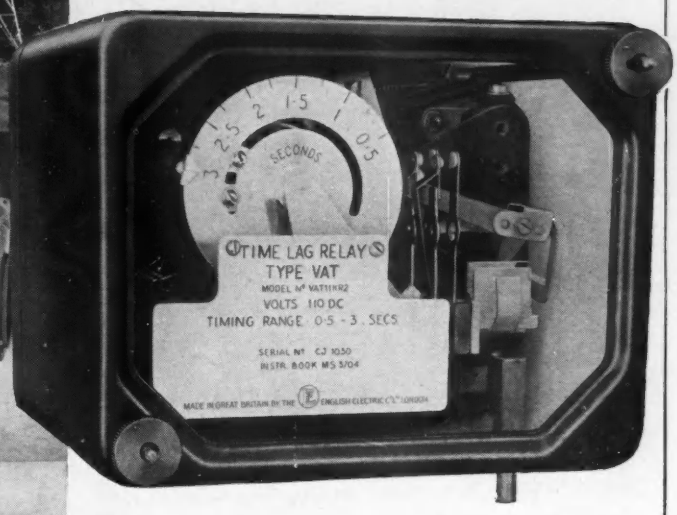

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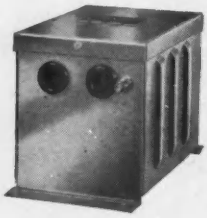

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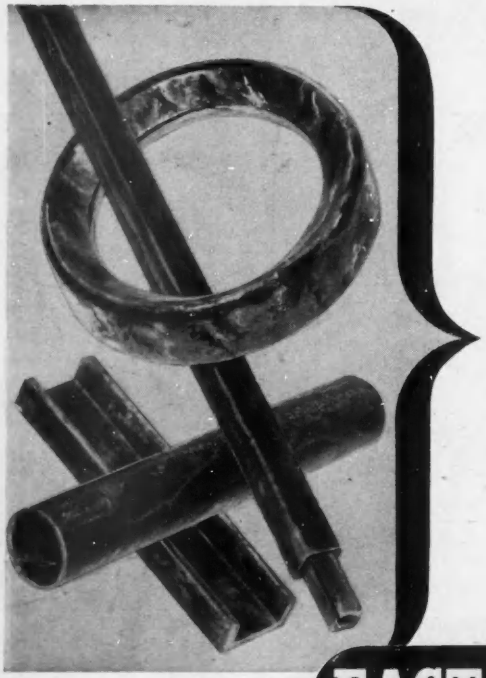

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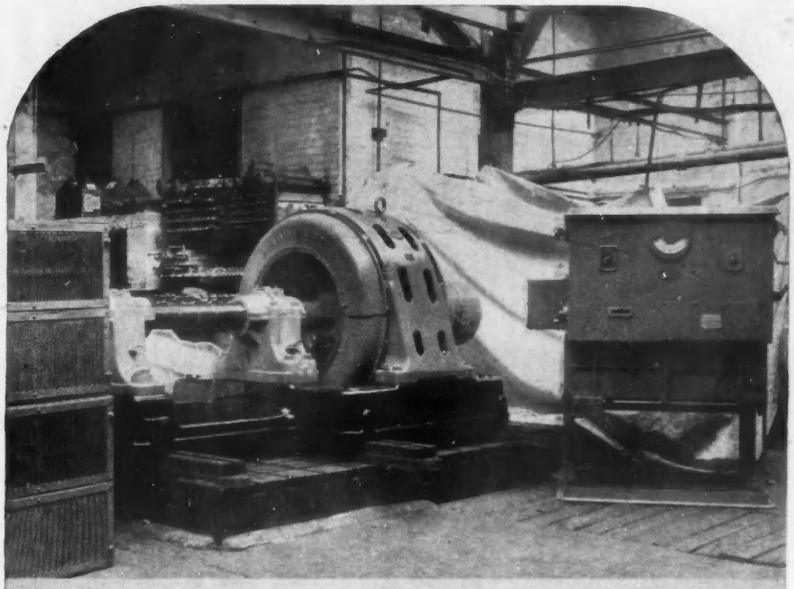

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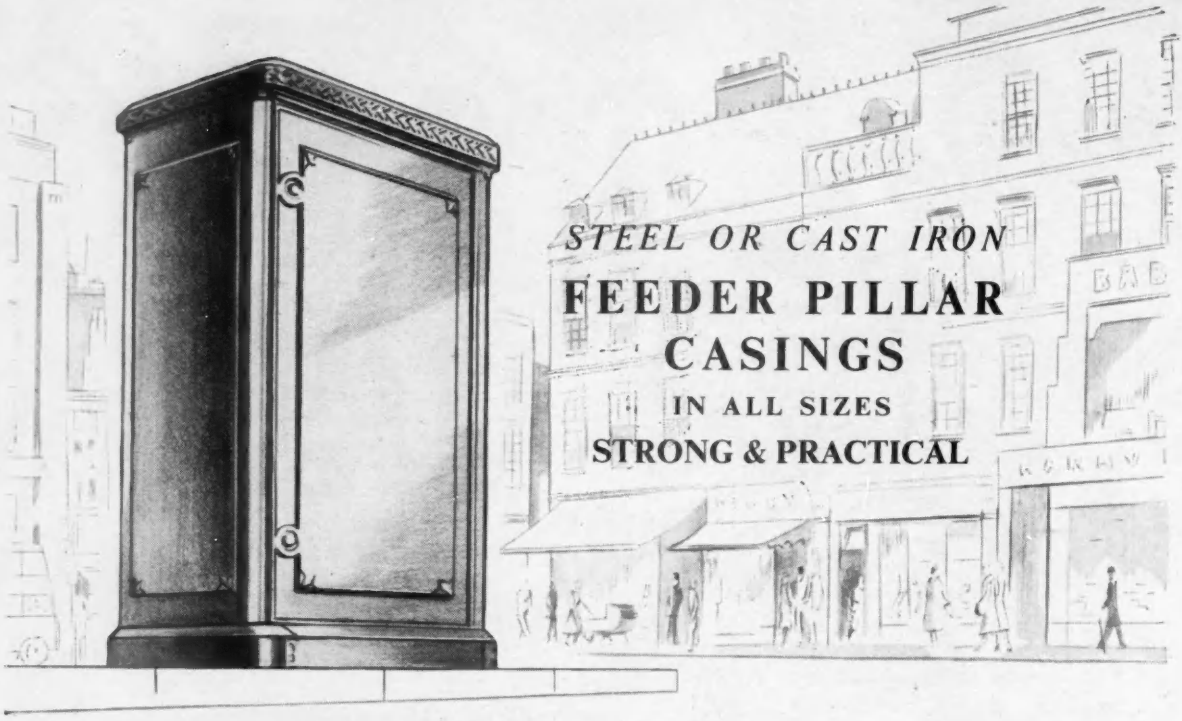

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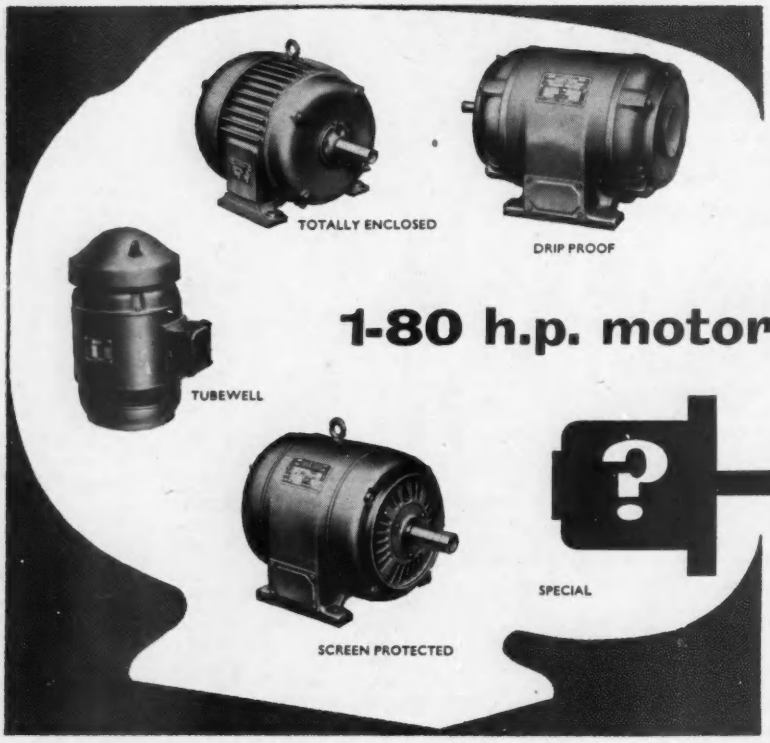

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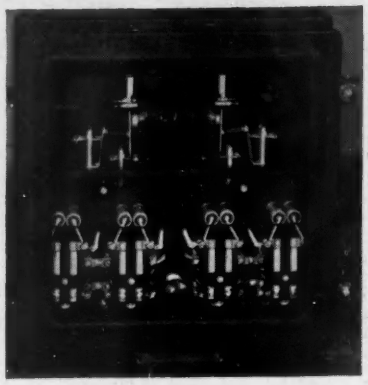

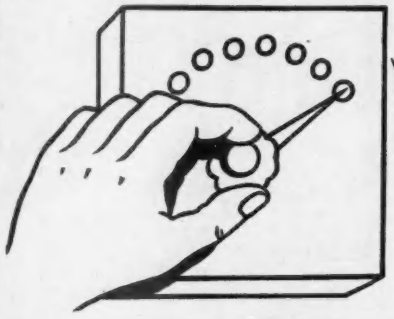

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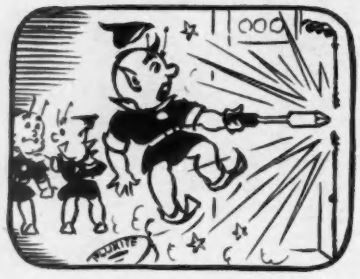

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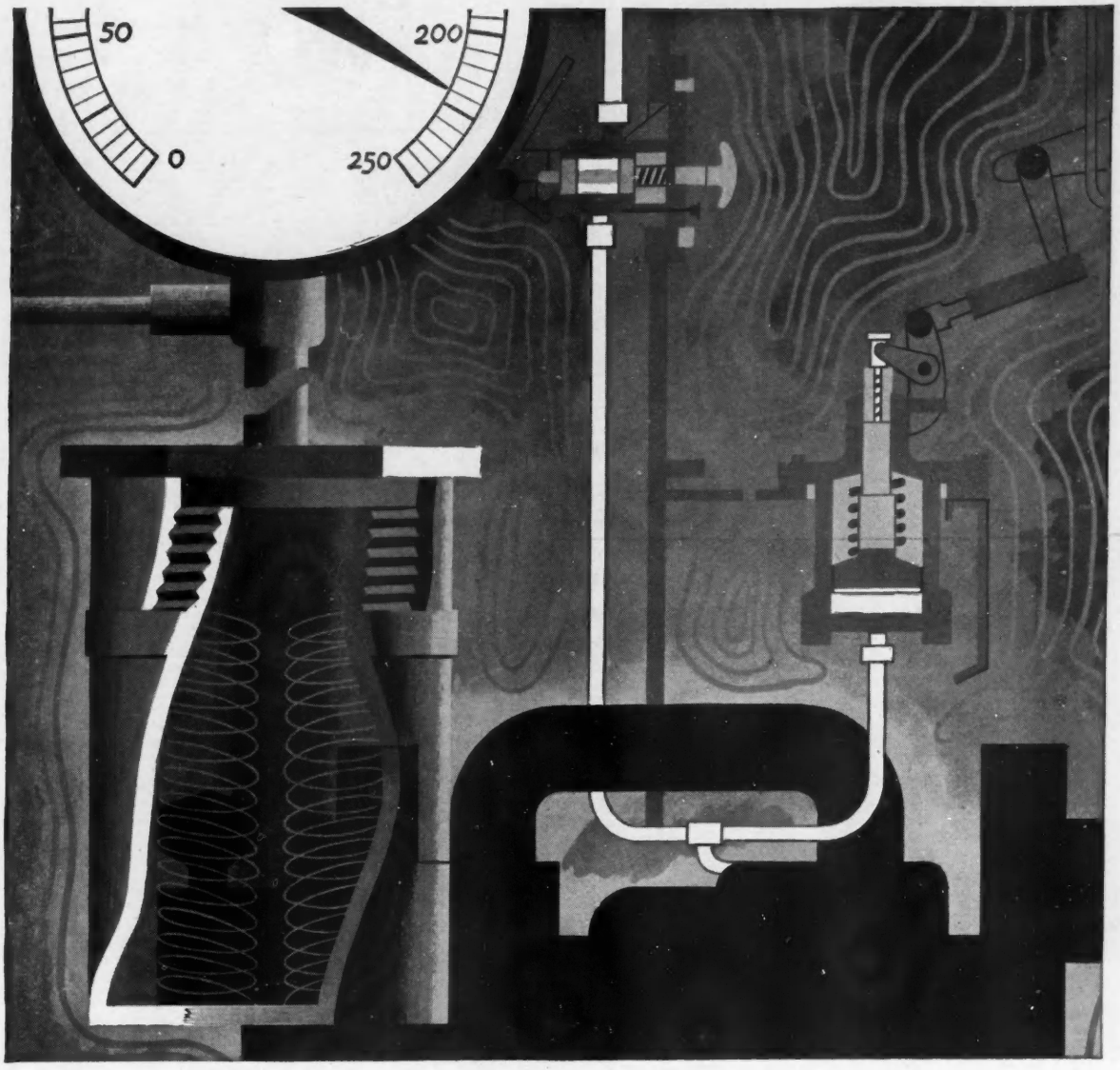

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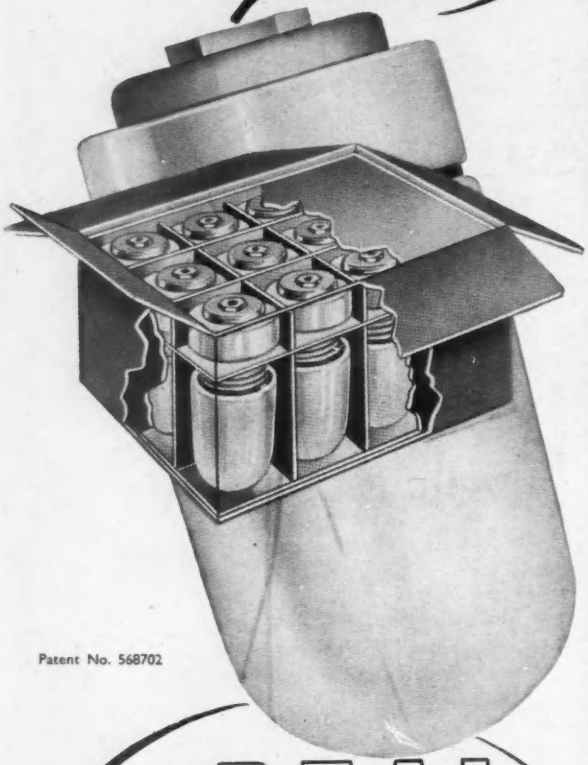

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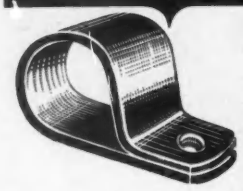

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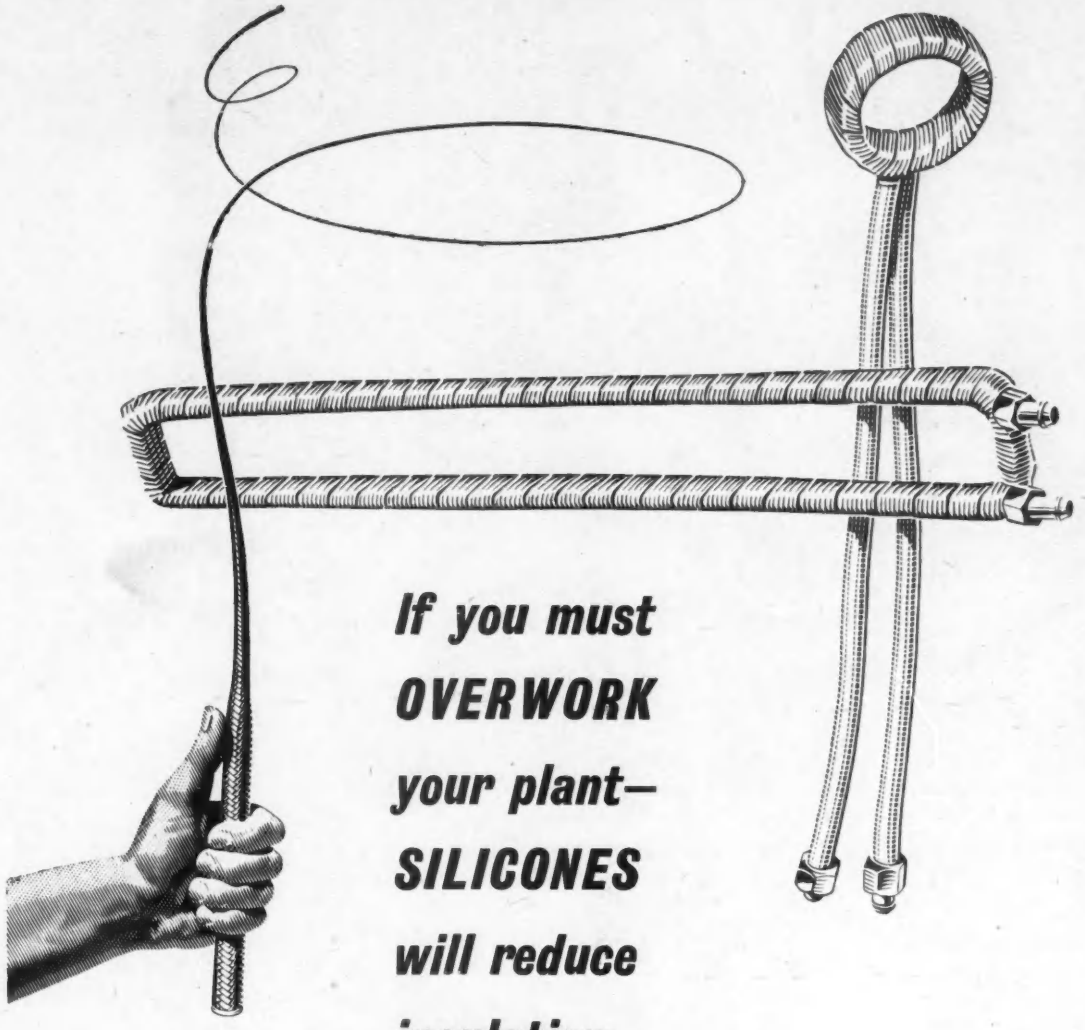

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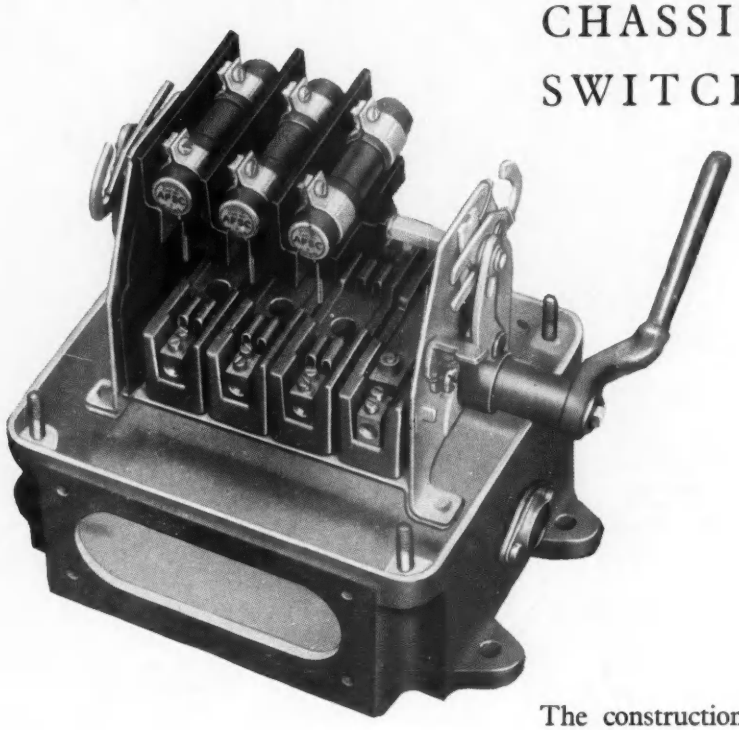

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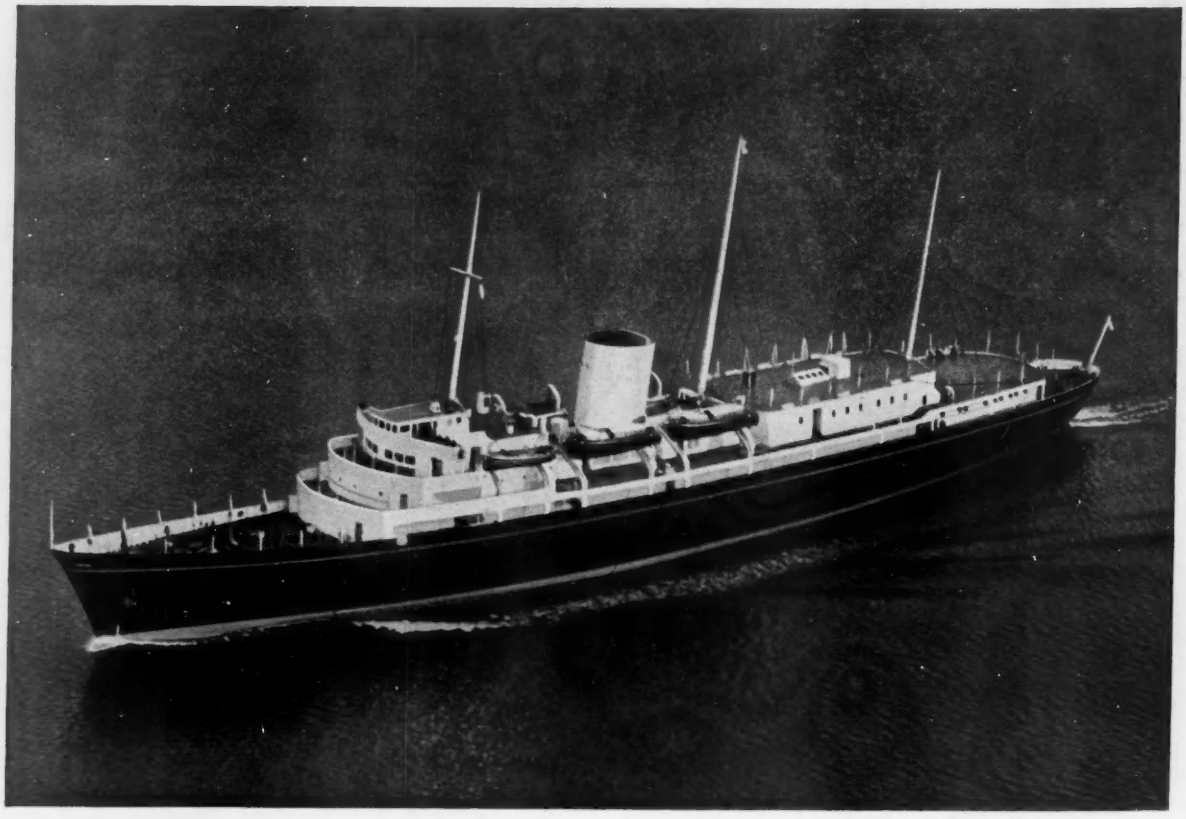

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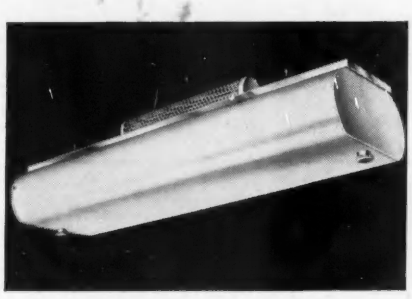

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